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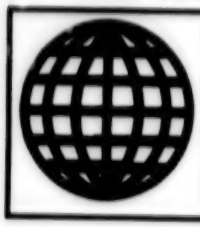

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The Pathogenesis of Weightlessness

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[Article by Ye. A. Kovalenko and I. I. Kasyan, Moscow]

[Text] Weightlessness is constantly acting on the human body during space flight. For more than a quarter of a century, the effects of this factor that is inconceivable on Earth have attracted the special attention of specialists in various fields of biology and medicine.

Analysis of the currently available data has shown that an individual may live and actually work in weightlessness for a year, with no highly pronounced changes in the body, but he must make sufficient use of an whole array of preventive measures. Since weightlessness is an affecting factor that is new to the human body and since there are no precise data as to short-term or long-term consequences of lengthy exposure, it is entirely appropriate to attempt this analysis from the standpoint of classical pathophysiology. In classical pathophysiology, the first thing that is usually done is to ascertain precisely the etiological factor and describe it in terms of the physical, chemical, or biological components of its action. Next, it is necessary to determine the setting in which it operates, since that setting may either diminish or intensify the action of the etiological factor. Finally, one must determine the basic pathogenetic elements in the development of certain changes or disturbances in the body and must track the entire chain of such changes. It is also necessary to identify the protective or compensatory changes in a number of systems of the body. They should not merely be viewed as adaptive responses, which is what is usually done in the analysis of the effects of weightlessness, but as protective responses to a deviation from the norm. This is a new, fundamentally important approach that has obvious merit at this point in the analysis of the problem, now that space flights are becoming quite long. We know that drastically intensifying or drastically reducing the force or duration of any factor acting on the body can lead to pathological changes.

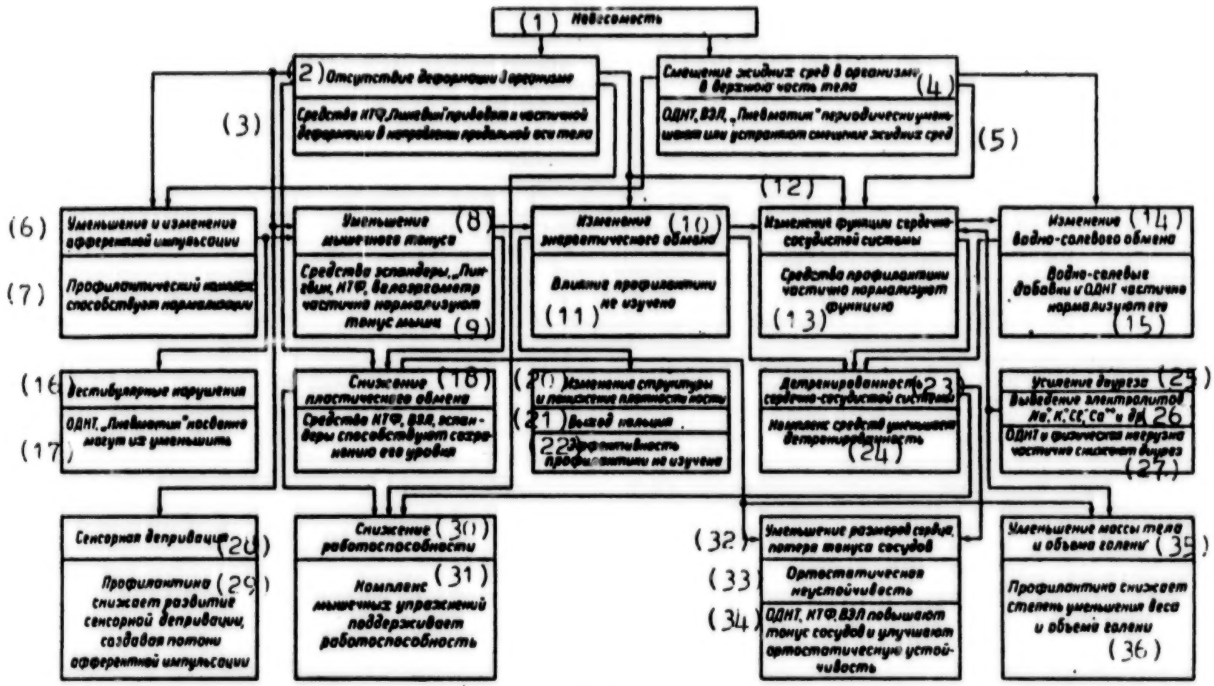
We shall try to view weightlessness from a pathophysiological standpoint, as more than just an etiological factor that causes adaptive responses, but primarily as a possible cause of certain clearly traceable deviations of functions from their normal state. We assume that those changes arise in weightlessness even after the period of adaptation and may intensify with prolonged exposure. According to this supposition, in the absence of effective preventive means, weightlessness may gradually give rise to certain pathological changes.

The accomplishments of our space medicine and its tangible, practical achievements during long-duration space flights lasting as long as 237-326 days testify to the fact that, at this stage, a rather effective complex of protective measures has been found for eliminating the major elements in the pathologenesis of the action of weightlessness on the body. During flight, the individual is affected not only by weightlessness, but also by a systematically performed, continually improved complex of preventive measures. Thus, we cannot speak of the action of weightlessness in pure form. We are dealing not just with a possibly pathogenetic factor, but also with such conditions where the action of this factor is considerably diminished. And the existence of certain changes in functions and biochemical indices during weightlessness, plus the persistence of rather distinct changes in a number of parameters for a certain time after the flight, indicates that the preventive measures are not perfect. Careful study of just such changes, which are not always conspicuous, is of great theoretical value in understanding the overall picture of the possible mechanism of action of weightlessness. Consideration of this question is also important for practical purposes, since it reveals not only which adverse changes the current preventive measures have been unable to eliminate during prolonged action of weightlessness on the body, but also to what extent and in what systems.

Just what are the pathogenetic elements in the effects of weightlessness on the body? First of all, weightlessness eliminates deformation, i.e., a given compression of tissues, organs, and systems. The flow of afferent signals from the receptors of tissues and organs that perviously were offset and stretched is, to a considerable extent, eliminated, diminished, or altered. Such is the primary neurogenic mechanism of the main pathogenetic element of the effect of weightlessness—the element involving removal of deformations.

The next important factor in the pathogenesis of the effects of weightlessness is the removal of the hydrostatic pressure of the blood and the relative shift of the fluid media of the body, especially the now-weightless blood, into the upper portion of the body. At this point, the shifted blood and fluid stretches the vessels and tissues to some extent. Those are the two main elements in the mechanism of the effect of weightlessness that can give rise to a whole series of subsequent derivative elements of pathogenesis (see the figure).

Let us examine them in greater detail. In weightlessness, there is a fundamental change in the nature of the afferent pulsation from the receptors of a number of systems and organs: from otoliths, from the receptors for tactile sensitivity, from the proprioceptors, and from the enteroceptors of the organs and tissues that undergotheir customary deformation and tension on earth, as well as from vascular regions, the hollow organs, and so forth. The displacement of blood to the upper body diminishes the influence of pulsation from the vessels of the lower body and substantially intensifies the pulsation from the vessels of the upper body. A redistribution of the afferent flow of signals takes place. The presence of this element in the pathogenesis of the effects of weightlessness is, as a rule, noted subjectively by all cosmonauts. Thus, for



Changes in the Body That Occur in Weightlessness and the Complex of Preventive Measures Carried Out on Long-Duration Space Flights

Key: 1. Weightlessness—2. Lack of deformation in the body—3. Complex of conditioning factors (CCF) and Pingvin unit produce partial deformation in the direction of the lengthwise body axis—4. Shift of fluid media to the upper body—5. Negative pressure on lower body (NPLB), bicycle-ergometer (VEL), and Pnevmatik unit periodically diminish or eliminate the displacement of fluids—6. Decrease and change in afferent pulsation—7. Preventive complex helps in normalization—8. Reduction in muscle tone—9. Expanders, Pingvin, CCF, and bicycle-ergometer partially normalize muscle tone—10. Change in energy metabolism—11. Effect of prevention unstudied—12. Change in cardiovascular system function—13. Preventive measures partially normalize function—14. Change in water-salt metabolism—15. water and salt supplements and NPLB partially normalize water-salt metabolism—16. Vestibular disturbances—17. NPLB and Pnevmatik may indirectly alleviate vestibular disturbances—18. Decrease in plastic metabolism—19. CCF, VEL, and expanders help maintain level of plastic metabolism—20. Change in bone structure and reduction in bone density—21. Calcium loss—22. Efficacy of prevention unstudied—23. Deconditioning of cardiovascular system—24. Complex of measures reduces deconditioning—25. Intensification of diuresis—26. Removal of electrolytes Na^+, K^+, Cl^-, Ca^{++}, and others—27. NPLB and physical exercise partially reduce diuresis—28. Sensory deprivation—29. Prevention moderates development of sensory deprivation by creating flow of afferent pulsation—30. Reduced work capacity—31. Complex of muscle exercises maintains work capacity—32. Reduction in size of heart, loss of vascular tone—33. Orthostatic instability—34. NPLB, CCF, VEL increase vascular tone and improve orthostatic stability—35. Reduction in body weight and volume of lower leg—36. Prevention lessens degree of weight and leg-volume loss

example, among the members of the crew of the first expedition aboard the Salyut-6 station, the unpleasant sensation of blood rushing to the head was felt as early as 3-4 hours into their stay in weightlessness. All the crew members of the third expedition aboard Salyut-y felt the blood rushing to their heads for 48 hours, and then the sensation passed and did not interfere with their work for the remainder of the flight.

It is interesting to note that, during long-duration flights, the abrupt shifting of the body's fluids has generally resulted in an upward displacement of the overall center of gravity of the cosmonauts. For example, leg volume in the American astronauts aboard the Skylab orbital station diminished by an average of 13%, when compared with the initial data.[26] Similar changes were found during the long-duration flights of Soviet cosmonauts. For example, on a 140-day flight, the lower-leg volume of both cosmonauts had decreased by 11-13% after 10 days, and by as much as 20-30% by days 80-100 of the flight.[6] That suggests that a definite displacement of fluids occurs, followed by a reduction in the mass of the upper and lower legs. After that, other elements of the pathogenesis become involved; they are elements that are linked primarily to the redistribution of the blood and body fluids to the upper body (see figure). The displacement of the blood to the upper body results in a certain

intensification of the signaling from the sinocarotid and aortal reflexogenic areas, i. e., depressor reflex effects are intensified.

The overfilling of the ostium venae cavae intensifies the Bainbridge reflex. In addition, after receiving the extra volumes of blood, lymph, and tissue fluid, all the receptor fields of the meninges and the vascular regions of the head and tissues initiate a series of relief mechanisms aimed at eliminating the plethora of blood in the head and upper body.

At the same time, there is a buildup of blood in the pulmonary circulation vessels and a buildup of pressure in the atria of the heart. This phenomenon may give rise to the next crucial element in the mechanism of action of weightlessness. The changes in the regulation of the water-salt metabolism deserve much attention. The cardinal mechanism of action here involves a stimulation of the receptor zones of the atria that send signals to the supraoptic nuclei of the hypothalamus, which in turn reduce the release of antidiuretic hormone and weaken the influence of the Henri-Hauer reflex. That brings about increased diuresis. However, such an explanation of the mechanism underlying the linkage between the blood circulation and the water-salt metabolism in weightlessness is clearly inadequate, even though it has been repeated often in the literature of recent years.

Recent years have seen a major discovery that involves an explanation of the endocrine function of the heart. It radically changes our ideas about the regulation of hemodynamics in the body, as well as the regulation of the water-salt metabolism. The auricles have been found to synthesize and secrete into the blood a peptide hormone, the so-called atrionatriuretic factor (ANF).[12, 13, 18-20] That hormone has a multifaceted influence, and it regulates, in particular, the vascular tone. The atrial hormone relaxes the vascular tone in the presence of angiotensin II and noradrenaline, even when their concentrations are an order of magnitude larger than that of ANF. Thus, the heart has the ability to countermand chemical signals sent by the cells of the other regulatory systems.[22] It has been demonstrated that after ANF enters the blood, its effect develops rapidly and reaches a maximum within 1-2 minutes. Diuresis and excretion of Na^+ and Ca^{2+} ions are intensified tenfold, but elimination of K^+ ions increases only slightly. In other words, intensification of ANF secretion via mechanical stimulation of the baroreceptors of the atria causes a copious secretion of urea and electrolytes, and that leads to a distinct lowering of the circulating volume of fluid. Thus, a new and crucial element has been discovered for regulating the water-salt homeostasis in the body, the changes in volume of circulating blood, and the vascular tone, and it leads to a decrease in arterial pressure and a change in hemodynamics.[20-23, 28]

Of course, in weightlessness, when there is a redistribution of the blood and a substantial increase in the blood volume in the atria, the secretion of ANF may be intensified. It is precisely here that we should look for changes in the regulation of the water-salt metabolism and blood circulation, with substantial involvement of the endocrine function of the atria in that regulation. C. Leach has shown it is shown that, in weightlessness, when venous pressure is elevated and atrial receptors are stimulated, ANF release is intensified, which increases the excretion of fluid and electrolytes through the kidneys, which helps change the volume of circulating blood.[27] Conversely, the level of antidiuretic hormone does not decrease—it actually increases. Consequently, the role and significance of ANF as the critical element in regulation of the water-salt metabolism and blood circulation have already begun to come under consideration in analysis of the materials gathered during space flight. This point, however, requires much more attention and careful study.

Another important element in the pathogenesis of weightlessness is the removal of the tension from the muscles responsible for resisting gravity. There first occurs a general reduction in the muscle tone, and there is no longer any need to overcome the force of gravity during movement. The diminution of the muscle tone and the sharp decrease in muscle function represent one of the crucial elements in the whole chain of pathogenesis, since they result in a decrease in the energy and plastic support of muscle function. In addition, deconditioning of the regulatory processes in the motor system is a natural result. The intricate, well-coordinated complex associated with regulation of movements is thrown into disarray.

An extremely important element of the pathogenesis involves the removal of stress from the bones, the change in their structure and metabolism (disrupted protein, phosphorus, and calcium metabolism), and their decalcification. After the flights aboard the Soyuz-4 and Soyuz-5 spacecraft, when the missions lasted no more than three days, the losses of mineral substance from the bones were slight; but when the mission duration increased to 18 days aboard the Soyuz-9, the decalcification of the heel bone increased on average by a factor of two, and that of the hand bones increased by a factor of almost three. A further increase in the mission duration to 24 days aboard Soyuz-11 led to a clear decrease in the optical density of the X-ray image of bone tissue. During the postflight period the decrease amounted to 16.0% on average, fluctuating between 13.7% and 18.0%, as compared with the initial data.[10]

Simulation of weightlessness via prolonged hypokinesia has shown that the optical density of the heel bone decreases by 8.5, 11.6, and 26.0% after 20, 70, and 100 days of hypokinesia, respectively. A number of animal studies have found inhibited formation of new bone, development of osteoporosis, and demineralization of bone tissue after flights lasting just 18.5-22 days. The development of osteoporosis and the decrease in density of the mineral saturation of the bones led to a reduction in their strength, so that some animals suffered bone fractures at the instant of touchdown of the biological satellites as a result of the impact.[17] Decreased bone

density after a flight has also been recorded in animals other than rats. Another very serious matter, evidently associated with the demineralization of the bones and the increased excretion of calcium from the body, is the increased number of calcium-protein agglutinations in the tubules of the kidneys of rats that had gone aloft aboard the biological satellites Kosmos-782, Kosmos-936, and Kosmos-1129. As is apparent, this element in the pathogenesis of weightlessness can also lead to serious changes in a number of systems of the body. In this connection, special attention should be given to changes in the calcium homeostasis in the body. According to modern views, the role of calcium and calmodulin in the body is exceptionally diversified and great. However, no data are yet available on the change in calmodulin in weightlessness.

One of the essential characteristics of the functional state of the body involves data on the change in the external respiration function in weightlessness. It is natural for the influx of venous blood into the lungs to intensify when blood-filling in the vessels of the lesser circulatory circle increases and the intensity of the venous return becomes greater in weightlessness. A certain increase occurs in the blood pressure in the vessels of the lesser circulatory circle, especially in the lungs. As a result, the relationship between blood perfusion and pulmonary ventilation flows that is well regulated in the Earth's gravity changes. By virtue of the change in the usual topography associated with blood-filling of the vessels of the lungs, a tendency may occur to a certain compensatory increase in the pulmonary ventilation to ensure oxygenation of the larger volume of venous blood entering the pulmonary vessels. As yet, there is little factual information on this point. Thus, an increase in the pulmonary ventilation was noted in seven of nine astronauts in a state of relative rest aboard one of the American orbital stations. In one astronaut, the pulmonary ventilation during flight remained at the prelaunch level; in another, pulmonary ventilation values dropped to below preflight values. In the commander of another orbital station, the pulmonary ventilation increased in flight to 9.98 l/min from 7.5; in the pilot, to 8.47 l/min from 6.69.[24-26]

During the mission of a visiting expedition aboard the Salyut-6 orbital station, minute respiratory volume (MRV) in the commander and the flight engineer rose 18-34% above preflight values when they were performing the Pnevmotest experiment in a state in weightlessness. A. M. Genin and colleagues[3] attribute the increase in the MRV to a respiratory rate that rose to levels above baseline levels.

During 140- and 175-day missions, the MRV of the cosmonauts (measured by means of the Polinom-2M apparatus) underwent ambiguous change: both an increase and a decrease were observed. Early in the mission (on day 10 of the 140-day mission and on day 20 of the 175-day mission), MRV dropped in the commander and the flight engineer to levels below preflight levels. By day 110 of the 140-day flight, the MRV of the commander and the flight engineer of the had stabilized and almost reached the preflight levels; whereas, starting on day 50 and continuing up to the end of the 175-day flight, an increase was observed in MRV to 10 l/min from 4 in the commander of the third expedition aboard the Salyut-6 station.[5]

Thus, the data obtained indicate that external respiration in weightlessness more often has a tendency to intensify. However, the cause of this change and the mechanism of its effect are, clearly, inadequately studied. It may be supposed that the increased blood-filling of the vessels of the lesser circulatory circle, as mentioned above, leads to increased pressure in the vessels, a change in the perfusion/ventilation relationships in the lungs that are natural under terrestrial conditions, and a subsequent reflex intensification of respiration, which is in fact observed during weightlessness, especially in the initial stage. Furthermore, it may be that—despite the absence of the force of gravity—the unusual and often elevated activity needed to maintain posture and ordinary motor acts when the new coordination of movements is not yet fully mastered, the additional vestibular influences that arise, and the certain effects of the stressful situation early in the stay in space help intensify external respiration and gas exchange. A unique situation comes about that may lead to a change in the degree of oxygenation of the blood in the lungs, as well as to certain changes in the vascular bed of the tissues, particularly in the upper half of the body, where the regional influences of congestion phenomena and even a certain degree of pastiness of the tissues may also come into play. Highly intriguing data have been obtained with rats that were kept in weightlessness for 22 days. The number of functional capillaries in the musculature of their rear limbs decreased by 30%, which testifies to a reduced vascularization in that tissue. All of this leads to reduced oxygenation of both the blood and the tissues in certain parts of the body.[4] Thus, it seems that both a general reduction in oxygenation of the blood in the lungs and changes in the regional oxygenation of tissues may occur. In this connection, a special investigation has been conducted on the dynamics of the oxygen tension in the tissues. It was established that the oxygen tension in the tissues of the cosmonauts during flight decreased on average from 56 +/- 2.0 to 30 +/- 3.0 mm Hg, while the rate of oxygen consumption in the investigated segment of tissue decreased from 13 to 8.7 +/- 0.9 mm Hg/min.[8] Hence, both the level of pO_2 in the tissues and the rate of tissue respiration decreased.

Later, as the nervous-emotional energy, mental stress, and adaptation to weightlessness subside, and also as new work habits are developed, a relative decrease in the external respiration function may take place in most of the cases. As for the possibility of change in the basic kinds of metabolism in weightlessness, we know that the most crucial processes providing for the basic vital requirements of the body are the energy and plastic metabolisms.

The absence of the constant stimulating action of the force of gravity, especially on the energy metabolism, may result in some deconditioning of the main conduit of synthesis of macroergs in the body in the form of reduced oxygen consumption in the tissues and diminished coupling of oxidation and phosphorylation in the muscles, to certain alterations and a weakening of the aerobic processes, and, possibly, to an activation of the anaerobic glycolytic processes. Moreover, a decrease in the activity of the Krebs enzymatic cycle (malate and isocitrate dehydrogenases) and an increased buildup of glycolysis products, especially lactate, took place in those who went aloft on 96- and 175-day flights. The increase in the content of nonesterified fatty acids and triglycerides, plus the simultaneous decrease in the levels of glucose and pyruvate, point to a decrease in the processes associated with the oxidation intensity in the body.[14] At the same time, more attention should be given today to the regulatory role of the neuropeptides in weightlessness, as well as to the change in the synthesis of secondary messengers (cAMP and cGMP). Thus, not only is the end link in the delivery of oxygen molecules to the peripheral tissues affected, but both the quantitative aspect and the quality of the oxidation products are also changed, with intensification of the less efficient glycolytic pathway of energy synthesis.

A direct and convincing proof of the change in the bioenergetics of the muscles after exposure to weightlessness is found in the data derived from the organs, especially the muscles, of rats that were aloft for 18-22 days aboard the Kosmos biosatellites.[11] A distinct decrease was demonstrated in tissue respiration and oxidative phosphorylation, as well as in the degree of coupling of oxidation and phosphorylation. Of course, these fundamental changes in the bioenergetics may also lead to a weakening of the stimuli designed to maintain the proper level of plastic metabolism in the muscles, the heart, the bone tissue, and so on. In other words, diminished stimulation of bioenergetics in the tissues results in a weakening of the dynamic equilibrium that exists on Earth between the processes of dissimilation and assimilation of the vital systems, i. e., one of the most fundamental pillars supporting the organic structure. That may have an effect on reduction of muscle mass and their capacity for work. It is very significant that the dimensions of the heart decrease, and its function may become weaker. It is also possible that, without proper preventive measures, the lack of constant intensity of muscle activity that is necessary on earth to overcome the force of gravity will not only bring about a deconditioning of the bioenergetics in the muscles, but will also lower the demands that exist on Earth for a periodic, abrupt increase in the delivery of oxygen and oxidation substrates and the flushing out of metabolic products that occur when the muscles are working. In other words, the demands on the transport systems of the body are lessened. That will induce first a functional and then a structural deconditioning of the heart muscle and vascular bed and will bring about a decrease in the overall volume of the skeletal muscles and in the mass of the myocardium and vascularization. Without a doubt, the strong emotional or physical stresses that arise can cause various disruptions in the functioning of the heart, especially in its rhythm. Thus, the weakening first of the entire complex of the energy metabolism and then of the structural-plastic metabolism and the transport factors can have special significance in the pathogenesis of the action of weightlessness on the body.[8]

The weakening in weightlessness of the function of the skeletal muscles that on Earth are usually used overcoming the force of gravity, plus the diminished heart function and vascular tone, will cause a weakening of the bioenergetic and structural potential of the body. Thus, it is also another of the fundamental, complex problems associated with the action of weightlessness on the body.

It is clear from the above that intense muscle conditioning during weightlessness will make it possible to substantially diminish those disruptions of the energy and plastic metabolism in the muscles, as well as prevent deconditioning of the heart. The complex of preventive measures that includes daily conditioning on the bicycle-ergometer (around 38,000-40,000 kgm) and walking on the treadmill for up to 4.33 km per day, with a gradual increase in the downward pull along the vertical axis of the body by means of a belt and cushioning devices, as well as almost constant wearing of weighted suits (12-16 hours per day), was designed to compensate for, to some degree, the absence of the influence of the force of gravity. Overall, excellent results have been achieved on long-duration flights when special attention is given to physical exercise.[15]

It is necessary to consider yet another element in the mechanism of action of weightlessness, especially that which is operating at the start of the flight. This element stems from the change—or more precisely, the imbalance—in the well-tuned system of interaction among the analyzers, the orientation of the body in space, and, above all, the signals from the otolith apparatus. When an individual is placed in weightlessness, the otolith apparatus, the tactile receptors of the skin, the proprioceptive signals, and the enteroceptors, because of the lack of deformation, tension, and pressure on the receptors, may send distorted afferent signaling, which will result in illusory sensations as to the position of the body, an upside-down feeling, a sensation of floating, of rotation, and so forth. Autonomic disorders manifested by paleness of the face, vertigo, and sometimes nausea, also come into play. At the same time, there are fluctuations in the arterial pressure, the pulse rate, and rate of respiration, and a cold sweat develops—i. e., distinct and prominent autonomic disturbances. This element in the pathogenesis of weightlessness is important because the autonomic influences on the vascular system, including the vessels of the upper half of the body, coincide with a drastic change in the distribution of the blood, especially an increase in the blood-filling of the vessels of the head and brain.[16] This circumstance can intensify considerably the unpleasant autonomic disturbances that are

especially conspicuous during the first days of an individual's stay in weightlessness and that sometimes last for an even longer period.

Based on the above scheme of action of weightlessness on the body, let us examine the subjective and objective changes that, despite the rather powerful complex of preventive measures, have continued to occur during, and especially after, long-duration space flights.

In the first hours of weightlessness, two main symptoms have occurred in the cosmonauts. First, a feeling of blood rushing to the head is observed, the duration and degree of expression varying with the individual. Most of the cosmonauts have noted a stuffy nose, a feeling of distension in the head, and a puffiness of the face. The second major subjective symptom during the first day of flight has involved pronounced autonomic disturbances in the form of distinct discomfort and various illusory sensations. It should be stressed that these two very elements in the pathogenesis of weightlessness, despite the already accumulated experience with the use of the full complex of preventive measures, still exert considerable influence during long-duration flights. An important element in understanding the initial period of action of weightlessness, and one that is still unstudied, is the establishment of clear functional correlations between the vestibular apparatus itself and its autonomic components. In this connection, much interest attaches to the studies of I. I. Bryanov and colleagues,[1] who have shown that the disturbances in the hemodynamics with certain microcirculatory disorders on the tissue and intercellular levels, the hypertensive trend of the shifts, and the disturbances in the water-salt metabolism with tissue imbalance of potassium and calcium ions create fertile soil for development of vestibulo-autonomic disorders in weightlessness. In this setting, it is entirely possible that distinct reactions may develop to threshold or even subthreshold vestibular stimuli caused by the movement of the head and body during space flight. Bryanov and colleagues[1] advance their own hypothesis, relying on the following factors. There is a known correlation between the state of the hemodynamics and the state of the vestibular system. Distinct vestibular disturbances are known for hypertensive syndrome and congestive processes with plethora of the cerebral vessels. Now, it should be noted that the vestibular nuclei have the most ample vascularization per cubic millimeter of tissue, and they are extremely sensitive to increase or decrease in the blood circulation. The authors stress the fact that, on the ground, test subjects during the first days of clinostatic and especially antiorthostatic hypokinesia mention illusory sensations of an upside-down position of the body, dizziness, and even nausea during rapid head turns. They are associated with characteristic changes in hemodynamics that point to elevated intracranial pressure and obstruction of the venous drainage. Evidently, the increase in blood-filling the vestibular nuclei of the brain also plays a very important role here. The following aspect should be considered alongside the phenomena of venous congestion and obstructions of the venous drainage. The unique stimuli of the vestibular nuclei that are produced in weightlessness can lead to acute spasms of the cranial vessels and to the possible disturbances of blood circulation of the brain. The connection between vestibular nuclei and cerebral blood flow features was noted as far back as 1961 by P. N. Klosovskiy and Ye. N. Kosmarskaya.[7] Furthermore, it is well known that processes involving stimulation of the vestibular nuclei during sea-sickness and motion sickness produce a distinct spasm of the vessels in the basin of the carotid artery, which is outwardly manifested as a sudden paleness of the face. It is natural to assume that, along with the spasm, the combined influence of venous congestion and a certain degree of hypoxia of the cerebrum are part of the pathogenesis of the disorders observed in these cases. In simulation experiments, a decrease in pO_2 in the skin of the face, i. e., in the vascularization basin of the external carotid artery, was directly proved in sea-sickness.[9]

Indirect data showing an increase in the central venous pressure in the participants of all long-duration flights deserve special attention. In addition to this, the venous pressure in the blood vessels of the lower legs of the cosmonauts who went aloft on the 140- and 175-day flights (determined by the method of occlusion plethysmography) decreased in the presence of a lowering of venous tone and a substantial increase in venous elasticity.[2] This deserves special notice in view of the use of negative pressure on the lower body in space flight, which may not always be so auspicious with the increased elasticity and reduced venous tone. It should be pointed out that the preventive measures carried out during long-duration flights (flights lasting between 237 and 326 days) have largely eliminated the adverse effects of weightlessness on the cardiovascular system. But in itself, in pure form, without preventive measures, the action of weightlessness is by no means as neutral as it may at first appear, there being no detailed analysis of the facts at hand, which were obtained with the use of constant preventive measures. It is perfectly clear that the complex of preventive measures that has been developed has been able to mitigate most of the unpleasant effects of weightlessness on long-duration flights (lasting 237-326 days).[15] Even so, despite the extremely promising results and the success achieved, we feel that the long-term action of weightlessness should be treated with extreme caution. Even the slight changes should all be analyzed scrupulously, since a number of changes in the body still remain for a certain time after short- and long-duration flights.

It may be presumed that the use of the preventive measures -the expanders, the treadmill, the bicycle-ergometers, the special weighted suits—on long-duration space flights has proved effective because such measures have been able to abate significantly the prime elements in the mechanism of action of weightlessness.

Thus, the effort to approach the analysis of the action of prolonged weightlessness on the body and prevention thereof from the standpoint of classical pathophysiology is evidently fully justified.

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Intensification of Process of Synthesizing Formaldehyde as First Stage in Obtaining Carbohydrates From Products of Vital Activity

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[Article by V. M. Zlotopolskiy, B. G. Grishayenkov, and I. A. Smirnov]

[Text] Solving, even partially, the problem of producing food on board a spacecraft during extended flights will make it possible to significantly reduce the mass characteristics of life support systems and increase flight self-containment.

Carbohydrates constitute the main portion of the human diet. About 70 percent of foodstuffs are carbohydrates.

Direct physicochemical synthesis of sugars from inorganic substances—water, carbon dioxide, carbon monoxide, and hydrogen—has yet to be accomplished despite the large amount of work that has been done in this direction.

The process of synthesizing carbohydrates from products of human's vital activity must therefore pass through a number of intermediate stages, the most important one being the stage of producing formaldehyde from gases.

An attempt was recently made to create a human life support system in space based on a pulsing arc plasma generator simulating the principle of chemical evolution.

However, the need to use low pressure (0.13 kPa) and the complexity of recirculating working gases creates a number of additional problems.

Another possibility for using nonequilibrium plasma chemistry processes is to use a barrier discharge.

It is known that in a barrier discharge carbon monoxide is reduced to formaldehyde. A relatively high yield of end product (up to 34 percent) has been obtained elsewhere.[1] But it was obtained after a rather long period of time (12 hours), which obviously indicates the low efficiency of this process.

We attempted to intensify the process of synthesizing formaldehyde. The aforementioned work[1] points to the probability of the appearance of a chemical compound as an intermediary during the synthesis of formaldehyde form carbon monoxide and hydrogen. It is hypothesized that methane is such a substance. Tests performed by us confirmed this hypothesis. A small addition of methane (3 to 5 percent) exerts a catalytic effect on the synthesis process, increasing the yield from 6.5 to 9.9 percent. This is probably explained by the stabilizing effect of methane on the excited formaldehyde molecules formed as a result of the recombination of atomic hydrogen and the formyl radical.

Further search for ways of intensifying the process entailed the subsequent combination of plasma and catalytic chambers in a single device.

Methodology

Zinc oxide reduced in a hydrogen current was used as a catalyst. The separate and joint effect of a discharge and catalyst on the formaldehyde formation process at different gas flow rates were studied.

As is evident from Table 1, under the effect of a single discharge, the increase in gas velocity results in a reduction in the degree of transformation that is evidently connected with the insufficient time for which the gas is in the reaction space. During the work of the catalyst alone, the gas's velocity has a weak effect on the formation of formaldehyde.

Table 1. Degrees of Transformation (in %) of Initial Gases Into Formaldehyde After Hour of Operation in Circulation Mode

Gas Flow Rate, L/min	Discharge	Catalyst	Combined Effect of Discharge and Catalyst
0.60	5.45	4.21	10.53
1.25	2.47	4.32	11.10
4.00	1.98	4.83	15.06
6.35	0	5.07	16.13

However, the simultaneous effect of the discharge and catalyst increase the anticipated total effect. And this difference increases as the velocity of the gas flow increases.

The secondary effect that appears is, in our view, linked to the selective recombination of the atoms, ions, and radicals formed (particularly the formyl radical) on the catalyst. It is known that the lifetime of these particles is short; therefore, increasing the velocity of the gas flow facilitates a more rapid reaching of the catalyst surface that in turn results in an increase in the yield of formaldehyde.

It has thus been shown that the process of synthesizing formaldehyde from carbon monoxide and hydrogen may be intensified by using both a homogeneous and heterogeneous catalyst, with the degree of transformation of the gaseous mixture into formaldehyde increasing 1.5-fold and tripling, respectively.

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Use of Hydrogen Peroxide and Lead Oxide To Purify Water of Urea

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[Article by I. I. Vasilenko, N. M. Shevel, and Yu. Ye. Sinyak]

[Text] Urine is among the most contaminating and hard-to-clean products of vital activity that must be regenerated in the life support systems of spacecraft and other orbiting hermetically sealed objects.[14] The main contaminating component of urine is urea, $CO(NH_2)_2$, the daily output of which amounts to 20 to 35 g per person.[12,14]

Sorption elimination of urea on extended space flights is restricted by the low absorbancy of $CO(NH_2)_2$ and by the need to regenerate or replace the sorbents. Impregnation with compounds of copper, chromium, silver, and other metals increases the sorption capacity of activated carbon with respect to $CO(NH_2)_2$ [10]; however, the water being cleaned must be treated for 72 hours.

Virtually complete decomposition of $CO(NH_2)_2$ to a residual concentration of 10 to 15 mg/L occurs as a result of hydrolysis at a temperature of 191 to 197°C for 25 to 45 minutes.[6] The shortcoming of the given method is in the formation of significant amounts of ammonia, the removal and salvaging of which represents a complex technical task under the operating conditions of isolated hermetically sealed objects.

Oxidation of urine admixtures with oxygen on oxide catalysts at 150 to 500°C has been studied in detail by one of the authors of the present article.[7,11] It is shown that the oxidation-catalytic method of regenerating water is universal but is only promising in the presence of a sufficient amount of thermal energy sources on board.

In the case of liquid-phase catalytic oxidation of impurities in water by hydrogen peroxide, i.e., H_2O_2, regeneration of the water does not require energy expenditures to heat and evaporate the liquid, heating of the catalysts, etc.[3]

At a content of 0.9 M H_2O_2 and 0.05 M H_2SO_4 in the temperature range from 12 to 50°C, homogeneous oxidation of $CO(NH_2)_2$ using H_2O_2 is not observed.[4] In the presence of platinized platinum in the same solution, the yield of oxidation products of $CO(NH_2)_2$ after 2 hours at 20°C does not exceed 6 percent, and it increases when the temperature is decreased. In an alkaline medium in the system Pt-H_2O_2-$CO(NH_2)_2$ at 40°C for 2 hours, 40 percent of the $CO(NH_2)_2$ is oxidized.[8] The high cost and short supply of platinum, the low degree of impurity conversion, and the need to precleanse the water of metal hydroxides and residual $CO(NH_2)_2$ are obstacles to using this method of regenerating water.

The present work presents the results of research on cleansing water of $CO(NH_2)_2$ by using H_2O_2 as a strong and ecologically clean oxidant and oxide catalysts providing a high degree of conversion of acetone and phenol into carbon dioxide at conventional temperatures and atmospheric pressure.[2,3]

Methods

Analytical-grade $CO(NH_2)_2$, PbO in a yellow modification, and chemically pure H_2O_2 were used in the research.

Aqueous solutions with $CO(NH_2)_2$ concentrations that are close to the content in human urine were subjected to cleaning. The water's degree of purity was found on the basis of the difference between the initial and final concentrations of $CO(NH_2)_2$ adjusted to its initial $CO(NH_2)_2$ concentration and expressed as a percentage.

The $CO(NH_2)_2$ concentration in diluted (less than 0.3 g/L) solutions was determined by the photocolorimetric method based on the formation of a colored complex with diacetylmonoxime in the presence of thiosemicarbazide and iron ions.[16] The gasometric method[5] was used with a higher $CO(NH_2)_2$ content for the analysis.

Under the test conditions, the initial H_2O_2 concentration was close to or greater than necessary for complete oxidation of the $CO(NH_2)_2$ based on the reaction $CO(NH_2)_2 + 3H_2O_2 = CO_2 + N_2 + 5H_2O$.

The catalyst suspension was held for 30 minutes in a 10-ml solution of $CO(NH_2)_2$, 1 ml was sampled to determine the equilibrium concentration, H_2O_2 was added to a content of 1.2 to 1.4 M, and it was mixed with a magnetic mixer. The solution was thermostatted at 20 to 24°C to prevent hydrolysis of the $CO(NH_2)_2$ due to an increase in temperature as a result of the exothermicity of the catalytic reactions.

After the gas liberation ceased and after it was left for 30 minutes, the solution was washed and analyzed. A new batch of solution with the initial $CO(NH_2)_2$ concentration was added to the catalyst and held for 30 minutes, etc. The sedimentation of white residue when the liberated gases were passed through baryta water indicated the formation of carbon dioxide as an end product of the catalytic oxidation of $CO(NH_2)_2$. Traces of ammonia were also determined in the makeup of the gases by Nessler reagent.[13]

Results and Discussion

In the absence of H_2O_2, the $CO(NH_2)_2$ content in the solution was due solely to its absorption on the PbO surface. In this case, at 2 g PbO, the degree of purity of the first batch of solution with 5.4 to 5.8 mass percent $CO(NH_2)_2$ amounted to 8.7-9.2 percent, with no $CO(NH_2)_2$ being absorbed from the second and subsequent batches (Figure 1, curve I). When H_2O_2 was added, the first batch had a degree of purity of 10.3 percent under analogous conditions. It increased to 52 percent in subsequent batches (Figure 1, curve II; Figure 2).

The divergence of the beginning of curves I and II in Figure 1 indicates the complete oxidation of adsorbed $CO(NH_2)_2$, and the nature of curve I indicates the saturation of all of the absorption centers of the lead oxide with $CO(NH_2)_2$ molecules.

During the subsequent use of PbO in the presence of H_2O_2, the water's degree of purity increased. This is likely linked to the change in the catalyst's state. In particular, when Pb^{2+} is oxidized by using H_2O_2, atomic oxygen is adsorbed on the surface of the PbO.[3] In the absence of oxidizing impurities in the water, oxidation of PbO (II) by H_2O_2 results in the formation of surface structures with the composition Pb_3O_4.[1]

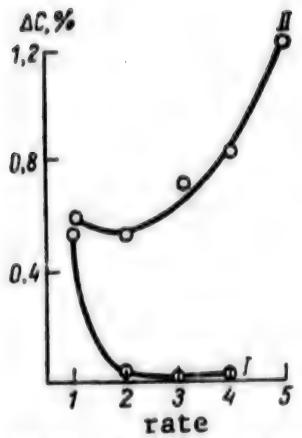

Figure 1. Reduction in the Concentration of Urea Owing to Absorption (I) and Oxidation (II) of Hydrogen Peroxide. (The initial urea content was 5.8 mass percent, with 2 g PbO and 1.2 M H_2O_2; 1, times)

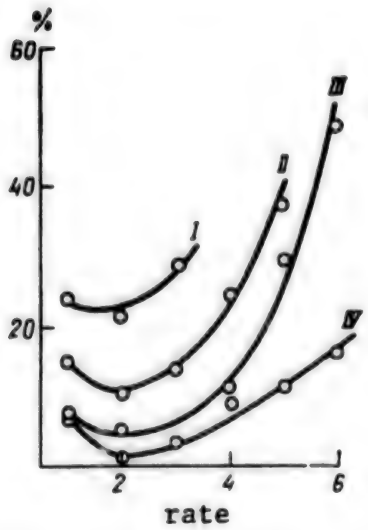

Figure 2. Effect of the Times a Catalyst Is Used on the Water's Degree of Purity. I, II, III, IV indicate 0, 5, 4, and 6 g PbO (initial urea content, 5.1 mass percent; 1.4 M H_2O_2); 1, times.

It is evident from Figure 2 that when the content of catalyst in the system is increased the observed regularity is maintained; however, the water's degree of purity is reduced. The reduction in the degree of $CO(NH_2)_2$ conversion that occurs in this case may be caused by the change in conditions for adsorption and oxidation of $CO(NH_2)_2$ or by the catalytic decomposition of H_2O_2.

The adsorbancy of organic impurities of wastewaters largely depends on the concentration of hydrogen ions in the solution.[9] Under the conditions of our tests, the 5 percent $CO(NH_2)_2$ solution had a pH of 6.95. When the water and aqueous solutions of $CO(NH_2)_2$ come into contact with the PbO, the pH changes, amounting respectively to 9.75 and 9.85 at a content of 1 g PbO per 10 ml. The final pH of the $CO(NH_2)_2$ solutions depends on the mass of the PbO; however, the difference between the pH values is insignificant (see Table 1) and cannot lead to the sharp decrease in the water's degree of purity upon an increase in the PbO content that was noted above (Figure 3, curves 1 through 3).

Table 1. pH of the $CO(NH_2)_2$ Solutions (5 mass percent) After Contact With PbO (volume of solution, 10 ml; duration of contact, 30 min)

Mass, g	pH Values Given Different Nos. of Contacts		
	1	2	3
1	9.85	8.90	8.75
2	10.00	9.80	9.55
4	10.15	9.95	9.65
6	10.25	10.05	9.95
10	10.48	10.20	10.00

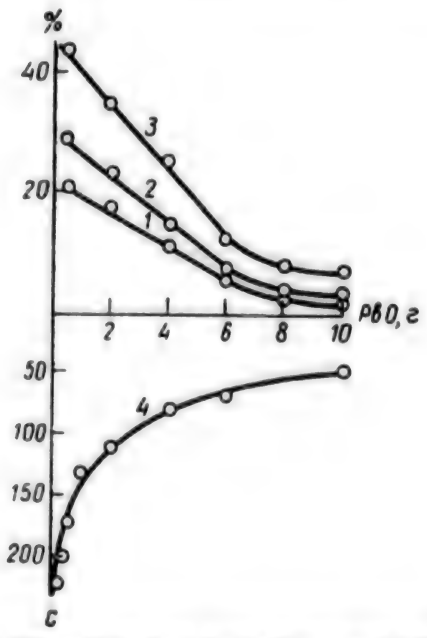

Figure 3. Effect of the Lead Oxide Mass on the Water's Degree of Purity of Urea (curves 1 through 3) and the Decomposition Rate of Hydrogen Peroxide (curve 4). The numbers 1, 2, and 3 respectively indicate double, triple, and quadruple use of the catalyst. The PbO mass is indicated in grams.

In the presence of H_2O_2 catalysts, the H_2O_2 is expended not only on the oxidation of the $CO(NH_2)_2$ but also on the catalytic decomposition. Special tests established the significant dependence of the decomposition rate of 10 ml 1.2 M H_2O_2 on the amount of PbO (Figure 3, curve 4). It should also be noted that the change in the yellow

color of the PbO to brown that is characteristic of PbO_4 is observed visually only at a PbO content of less than 2 g per 10 ml liquid.

It is obvious that the amount of adsorbed $CO(NH_2)_2$ increased in proportion to the amount of catalyst. However, the increase in the speed of the catalytic decomposition of H_2O_2 and the shortage of oxidant exert a decisive effect on the water's degree of purity when the mass of the PbO is increased. The slowdown of the activation of a large quantity of catalyst upon subsequent multiple use is also linked to the reduction in the contact time of the PbO and H_2O_2 and the slower modification of PbO.

In conclusion, we will note that the degree of $CO(NH_2)_2$ conversion in diluted solutions is not significant. In particular, at 0.51 mass percent $CO(NH_2)_2$, the degree of its conversion as a result of oxidation of 1.2 M H_2O_2 per 2 g PbO amounts to 9.8 percent overall. Moreover, the efficiency of cleansing water of $CO(NH_2)_2$ when H_2O_2 and PbO are used is generally much lower than when diluted solutions of acetone and phenol are used under analogous conditions.[2,3] The distinctive features noted are likely linked to the formation of a stable additive compound with the composition $CO(NH_2)_2 \cdot H_2O_2$.[15,17]

The fundamental possibility of using H_2O_2 and PbO for deep cleansing of $CO(NH_2)_2$ from water has thus been demonstrated. Achieving a high degree of $CO(NH_2)_2$ conversion into carbon dioxide requires maintaining an optimum content of PbO and a significant excess of H_2O_2.

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Antibiotic Sensitivity oi Human Opportunistic Microflora Before and After Enclosure in Hermetically Sealed Area

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[Article by N. A. Polikarpov and M. P. Bragina]

[Text] Opportunistic microorganisms are currently one of the leading etiologic factors of various infectious complications in man.[3,7] Moreover, gram-negative bacteria possess a number of specific features, the main ones being natural resistance to many medicinal preparations,[2] rapid acquisition of antibiotic resistance, and the capability of intra- and interspecies transmission of plasmids with multidrug resistance.[15] In addition, it is known that certain factors related to people's extended stay in hermetically sealed areas may exert an effect on the overall qualitative and quantitative makeup of human automicroflora.[4,5,9-11] It is therefore most interesting to study not only the quantitative fluctuations in the makeup of intestinal automicroflora but also the changes in their biological properties.

The main problem of the present work is to study the distinctive features of the formulation of antibiotic resistance by opportunistic microorganisms of the intestine of humans spending an extended amount of time in a hermetically sealed area.

Methodology

Fourteen persons were examined. Eight of them were examined before and after spending between 96 and 175 days in a hermetically sealed area. The examinations were conducted 30, 5, and 1 day before the beginning of the study and after its completion (on days 1, 5, and 10). A total of 800 cultures of opportunistic microorganisms were taken, including 370 Klebsiella pneumoniae, 120 Enterobacter aerogenes, 40 E. cloacae, 10 E. liquefaciens, and 260 Citrobacter freundii cultures.

The method of Z. Bendig and H. Haenel[12] was used to isolate enterobacteriae from feces. The method of G. P. Kalina[6] (using W. Ewing's tables[14] and V. Bergey's bacteria index[13]) was used to identify the opportunistic microorganism cultures.

The bacteria's sensitivity to drugs was determined by the method of diffusion in agar using disks and the method of two-series separation in a dense medium.[8] Statistical processing of the resultant data was done in accordance with the method proposed by I. P. Ashmarin and A. A. Vorobyev.[1]

Results and Discussion

An analysis of the antibioticograms of opportunistic microorganisms conducted 30, 5, and 1 day before the beginning of the study in a hermetically sealed area showed that the microorganisms isolated generally possessed resistance to between 1 and 3 drugs (ampicillin, rifampicin, and carbenicillin).

No significant changes were detected in the subjects' antibioticograms after a short stay (2 days) in a hermetically sealed area. Nevertheless, an increase in the number of antibiotic-resistant forms of opportunistic microorganisms was noted in 11 of 14 of the subjects after 6-8 and 96-175 days in the hermetically sealed area. During this period, microorganisms resistant to 10-13 antibacterial drugs were isolated in a number of cases. Most of the opportunistic enterobacteria isolated were resistant to 5-7 drugs. After 6 days in the hermetically sealed area, the subjects manifested an increase in the number of drug-resistant microorganisms of the species K. pneumoniae. The microorganisms were resistant to rifampicin, carbenicillin, cephaloridine, ampicillin, the drug 5-HOK, and biseptol. After 8 days in the hermetically sealed area, the subjects' antibiotic-sensitive species of enterobacteria were replaced by resistant species. In one of the subjects, the bacteria cultured after day 25 before the beginning of the study, i.e., enterobacteria of the species E. cloacae that were resistant to 2 drugs, were replaced by E. aerogenes that was resistant to 9 antibacterial drugs (tetracycline, streptomycin, rifampicin, furazolidone, carbenicillin, ampicillin, Neggram, cephaloridine, and biseptol). Serotyping results established that the previously cultured bacteria of the species C. freundii (serovar 09) that were resistant to two antibiotics (ampicillin and cephaloridine) were replaced by serovar 03 bacteria resistant to seven drugs (streptomycin, monomycin, rifampicin, carbenicillin, ampicillin, Neggram, and cephaloridine). The C. freundii 09 strains acquired resistance to rifampicin. The appearance of previously undetected enterobacteria of the species Citrobacter 03 is evidently explained by the "waveform" nature of the individual restructuring of the makeup of human intestinal automicroflora, which is characterized by a reduction in the number of some types of bacteria and an increase in the population of others.

After 7 days in the hermetically sealed area, one of the subjects manifested a culture of K. pneumoniae that was resistant to five antibiotics (levomycetin, rifampicin, Neggram, cephorin, and methacycline) and bacteria of the species E. aerogenes resistant to two drugs (monomycin and carbenicillin). Another subject exhibited enterobacteria of the genus Citrobacter that were resistant to levomycetin, cephaloridine, and rifampicin.

Similar data were obtained after people had spent longer periods in a hermetically sealed area. The opportunistic enterobacteria (C. freundii, E. cloacae, K. pneumoniae) isolated from one of the subjects on days 1, 7, and 12 after a 96-day stay in a hermetically sealed area were resistant to four drugs. Enterobacteria of the species K. pneumoniae that were detected in another subject were resistant to six drugs (streptomycin, monomycin, rifampicin, carbenicillin, ampicillin, and cephaloridine). In the given case, even on day 12 of the rehabilitation period, no restoration of the previous (from the standpoint of antibiotic resistance) opportunistic microflora makeup was observed.

The appearance of antibiotic-resistant cultures was also noted after completion of a 175-day study. On day 40 prior to the beginning of the study, the opportunistic microorganisms (K. pneumoniae) isolated from two subjects were sensitive to all of the drugs studied by us. The microorganisms isolated after 4 days exhibited resistance to three antibiotics. After the stay in the hermetically sealed area, one of the subjects manifested K. pneumoniae enterobacteria that were resistant to four chemotherapeutic preparations and E. aerogenes resistant to five. A parallel increase in the number of cultures with little sensitivity to polymyxin, neomycin, furazolidone, Neggram, and methacycline was also noted.

In conclusion, it should be noted that an overall analysis of the antibiotic sensitivity of the enterobacteria isolated from the individuals studied in the background period and in the first days after the research was completed revealed reliable differences in the resistance spectrum of these microorganisms to antibiotics (see Table 1). Thus, the mean statistical number of antibacterial drugs

to which opportunistic enterobacteria manifest resistance amounted to 3+/-0.22 before the beginning of the research. After the stay in the hermetically sealed area, their number increased to 6+/-0.29 ($p < 0$).

Table 1. Comparative Data on Spectrum of Antibiotic Sensitivity of Opportunistic Microflora of Individuals Examined

Type of Enterobacteria				Total Data on All Types of Enterobacteria
K. pneumoniae	E. aerogenes	E. cloacae	C. freundii	
Before enclosure in hermetically sealed area				
3+/-0.19(180)	3+/-0.15(60)	3+/-0.12(20)	3+/-0.22(140)	3+/-0.22(400)
After enclosure in hermetically sealed area				
7+/-0.22(60)	7+/-0.22(30)	4+/-0.4(10)	5+/-0.19(50)	6+/-0.29(150)

Note: Numbers of cultures are indicated in parentheses. Fourteen persons were examined.

The most pronounced change was discovered among enterobacteria of the species K. pneumoniae and E. aerogenes, i.e., from 3+/-0.19 to 7+/-0.22 and from 3+/-0.15 to 7+/-0.22, respectively.

Thus, analysis of the resultant data made it possible to discover the unidirection of the changes, confirming an expansion of the spectrum of resistance to antibacterial drugs on the part of opportunistic enterobacteria isolated from subjects staying in a hermetically sealed area under extreme conditions. On the basis of the serotyping data on the enterobacteria studied, it may be hypothesized that the mechanism of the phenomenon observed is one of an individual change in the makeup of intestinal microflora characterized by a decrease in the amount of some types of enterobacteria and an increase in others.

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UDC 629.78:574.682]:612

Information Interaction in Man-Aircraft System as Problem of Aviation Medicine

907C0059a Moscow KOSMICHESKAYA BIOLOGIYA I AVIAKOSMICHESKAYA MEDITSINA in Russian Vol 23 No 3 May-Jun 89 (signed to press 16 Mar 88) pp 28-32

[Article by V. V. Lapa]

[Text] Optimizing the conditions of a person's activity in aircraft cabins has always been looked upon as the main task of aviation medicine. Its traditional directions

solving the problems of increasing the organism's stability in the face the effect of unfavorable environmental factors and maintaining its fitness for work at a high level do not make it possible to completely guarantee a person's efficient and reliable activity in the system pilot-aircraft-environment since information interaction processes play the leading role in regulating interrelationships between the components of this system. It is precisely information exchange processes that constitute the main content of interaction in man-machine systems.

What is most interesting from the standpoint of aviation medicine is the fact that, on the one hand, information interaction determines the efficiency with which the pilot performs the tasks facing him; on the other hand, it may become a source of unreliable and erroneous actions or the cause for accidents, morbidity, and losses of professional direction. In particular, more than 60 percent of erroneous actions on the part of a pilot in flight are linked to the processes of receiving and processing information.[4,14] Shortcomings in the data base organization and support of human actions in a control system leading to information overloads or a shortage of information for making optimum decisions and organizing adequate behavior should be looked upon as psychologically traumatizing factors in professional activity. The role of negative emotional stress connected with shortcomings of data base organization and support (such as a large volume of highly important information that must be processed and assimilated, the difficulty of converting it, indeterminacy of its content, etc.) in the development of neurotic dysfunctions is emphasized in many works by physiologists.[1,3,7,12,13] The role of the information factor in the development of neurotic dysfunctions has been expressed in the demarcation of a special category of dysfunction—informational neuroses.[13] Proceeding from what has been stated above, we have deemed the problem of the psychophysiologic optimization of information interaction in man-aircraft systems to be one of the urgent problems in aviation medicine. In fact, from the standpoint of aviation medicine, the main task is maintaining occupational health. It may be looked upon as the principal trait of the pilot, who performs a special function in the system pilot-aircraft-environment. In view of this, maintaining occupational health is senseless unless those labor resources (above all, information display equipment) that are used to accomplish the goal of the flight assignment are optimized and help the individual achieve satisfaction with the results of his occupational activity. In any case, there is every basis for suggesting that optimizing information interaction is not only a means of increasing the efficiency and reliability of the functioning of a man-aircraft system but that it is also a necessary condition for maintaining occupational health.

The problem of the psychophysiologic optimization of information interaction, which is being examined here, has long been within the scope of aviation medicine. At the same time, its content and methodological foundations have undergone significant changes. In the fifties and sixties, the main efforts of aviation physicians and psychologists were directed at investigating the possibility of making perception easier by improving the formulation of the face portions of instruments, giving indicators an attention-getting effect. As a rule, one of the components of a pilot's activity has been subject to research. For example, the characteristics of the perception of instrument readings (their readability) during the effect of negative factors (poor illumination, limited exposure time, inconvenient location of the instrument, etc.) were assessed.[4,10] In this type of research the pilot's activity is reduced to elementary actions based on a stimulus-reaction scheme from which the unequivocal dependence of the person's behavior on the external stimulant follows. By analyzing only the environment (stimuli affecting the sense organs), however, it is not possible to discover the regularities that determine the efficiency of a pilot's activity. This requires research of the mental processes regulating actions during the process of purposeful activity.

We will present two examples confirming the validity of the given methodological approach.

The first example deals with validating the type of indication of the aircraft's spatial position with respect to banking on the gyrohorizons. Proceeding from the logic of "common sense," the "aircraft-to-ground" form of indication (a moving line of the artificial horizon and a stationary index symbolizing the aircraft) has been adopted abroad and in certain types of gyrohorizons in our country as the most natural form of indication corresponding to the view from the aircraft's cabin window. However, the experience of flights in clouds and experimental research has overturned the conclusions of "common sense." It turned out that during a flight without the visibility of the natural horizon, particularly in the case of a loss of spatial position in clouds, when piloting patterns are executed on the basis of instruments, the "ground to aircraft" form of indication (a movable aircraft symbol and horizon line that is stationary with respect to banking) is preferable as that which corresponds to the pilot's mental image. This image does not coincide with visual perception (the visible picture).

Here is yet another example. Analysis of pilot behavior in an accident situation made it possible to establish that the requirements for designing signal devices should be based on the psychophysiologic mechanisms that make actions efficient. The orientation reaction is a psychophysiologic mechanism that keys a person to the fact of a threat to flight safety. The requirements regarding selecting the physical force of emergency signals are established by means of this mechanism. Nevertheless, the quick detection of a signal provided by the orientation reaction far from always guarantees the reliability of actions, for the taking of a feasible action under new conditions is determined by a different mechanism, that is, by the processes of recognition and decision making.

As is evident from Figure 1, noninstrument and special attention-getting signals are detected within 1 second; however, the beginning of feasible action may lag 100 to 300 seconds behind the moment of the detection. The requirements regarding the semantic and content characteristics of emergency signals are governed by the need to support recognition and decision-making processes.

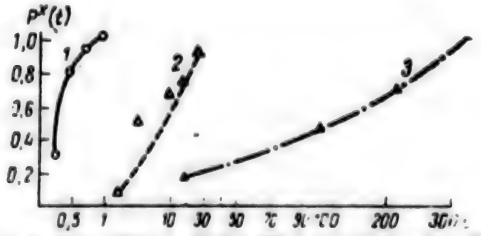

Figure 1. Dependence of the Characteristics of a Pilot's Activity in an Accident Situation on the Data Base Organization and Support for Recognition and Decision-Making Processes

Key: 1. Detection time 2. Recognition time given specified signal 3. Recognition time given unspecified signal

In our view, the examples presented are rather convincing confirmation of the fact that designing optimum equipment to display information assumes the use of a systems approach,[6,8,9,11] subordinating the task of designing them to the interests of the pilot's integral activity. This approach determines the investigation of the psychophysiologic content and regularities of information interaction as a necessary foundation for performing practical tasks related to improving information display equipment.

The determinant value of allowing for psychophysiologic mechanisms regulating a pilot's actions when information-coding methods are selected has been confirmed by research on a pilot's interaction with new interaction display equipment—indicators based on cathode ray tubes [CRT].

The point is that methods of coding piloting information based on electronic indicators are fundamentally different from traditional methods. Thus, the main piloting information is issued not on conventional round scales but rather on vertical and horizontal scales, counters are widely used, other forms of representing information about the aircraft's spatial position are used, the scales of one and the same parameter are changed from mode to mode, etc. Even though all of these distinctive features are feasible from the standpoint of configuring an information display system, from the standpoint of supporting the human factor, they are sooner psychological obstacles than advantages. We have drawn the latter conclusion on the basis of experimental data about the great increase in the load on perceptive and thought processes, the partial deautomation of the practice of piloting, and an increase in the pilot's nervous and emotional stress owing to the discrepancy between the methods of coding piloting information on CRTs and the psychophysiologic regularities of converting it into an integrated image of the flight. Moreover, the forced transition form one information model (a CRT-based piloting indicator) to another (electromechanical instruments) results in a worsening of the efficiency indicators and an impairment in the structure of a pilot's actions (Table 1). This is linked to problems in regulating them owing to the discrepancy between the mental images of the various information models. This transition is accompanied by processes of restructuring images (or replacing them) that, because they are conscious, require a special direction of the pilot's voluntary attention, which has a negative impact on the efficiency of his actions.

Table 1. Quality and Structure of Pilot's Actions During Change in Methods of Coding Flight Parameters

Change in indicators,%	Simple Maneuver	Complex Maneuver
Reduction in precision of maintaining flight parameters:	8-15	12-27
Increase in travel of rudders:		
Stabilizer	26	36
Aileron	14	25
Increase in number of shifts of glance	15	50

As has been shown by research conducted in our laboratory, the psychological similarity of different information models, including the identity of coding principles and the similarity of the main elements of piloting parameter scales (scales, increment values, locations of the zero mark, etc.), plays a decisive role in increasing the efficiency of a pilot's combined use of different information models. This makes it possible to preserve the continuity of the mental images of a flight, eliminates the need for restructuring of the pilot's system of mentally regulating his actions, and ultimately makes his activity efficient (preservation of the required precision of maintaining flight parameters and the structure of the practice of piloting) after a forced transition from one information model to another.

The acuteness of the problem of psychophysiologic optimization of information interaction in man-aircraft systems is largely linked to the wide-scale introduction of automatic control equipment. Automation is accompanied by a change in the content of information exchange processes in connection with the exclusion of a motor analyzer from the functional system of afferent synthesis. These changes result in a reduction of the pilot's activity, which has a negative impact on the reliability of monitoring the parameters of the functional system pilot-aircraft as well as on the implementation of controlling motions in the event of an extraneous switch to manual control. Motor errors, test motions by the control organs, and a lag of 10 to 30 seconds before the beginning of feasible actions (the pilot needs this time to

restore proprioceptive control of his actions) are observed under these conditions.[5] In the given case, methods of increasing the reliability of a pilot's actions should above all compensate for impairments in the information interaction. These methods involve optimizing information display equipment, changing the form of automatic control, and training, i.e., with the pilot's forming an adequate image of the flight.[2] In particular, saving reverse afferentation from the motor analyzer in the event of a change in the automatic control circuit proving joint control on the part of a person and automaton makes it possible to maintain a pilot's activity and his readiness for extraneous actions (Table 2).

Table 2. Indicators of Pilot's Activity as a Function of the Type of Control

Indicator	Type of Control		
	Automatic	Mixed	Manual
No. of shifts of glance (per minute)	30-50	60-80	80-120
Average amplitude of electromyogram of flexors of wrist and fingers of right hand, μV	—	33.6	42.7
Probability of recognizing failures of automation equipment, relative units	0.36	1.0	—
Probability of timely elimination of consequences of failure, relative units	0.5	0.9	—

On the whole, the experimental data related to the psychophysiologic regularities of information interaction in a man-aircraft system confirm the fundamental possibility of exerting a purposeful effect (by changing the characteristics of the information medium) on the mental regulatory system and thus on the efficiency of actions and, to a certain degree, on the pilot's condition. In the given context, it is entirely justifiable to look upon information interaction as that form of interaction between a subject and the environment that plays a leading role in providing behavioral adaptation. Depending on the complexity of the content and conditions of activity, on the nature of the requirements imposed upon it, and on many other specific forces, certain functional links of the control system should be actualized by information resources. By facilitating the formation of adequate content of the regulatory mechanism and changing the degree of consciousness of one of its links or another, we will undoubtedly obtain definite advances, both on the plane of controlling particular features of implementing some actions or others and on the plane of reducing the level of complexity and stressfulness of a pilot's actions, thus increasing its efficiency.

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UDC 620.187:582.263:581.84

Submicroscopic Organization of Chlorella Cells in a Multi-Component System in Space Flight

907C0035c Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR: SERIYA B—GEOLOGICHESKIYE, KHIMICHESKIYE I BIOLOGICHESKIYE NAUKI in Russian No 8, Aug 89 (manuscript received 16 Mar 89) pp 74-77

[Article by A. F. Popova, E. L. Kordyum, Academician K. M. Sytnik, Institute of Botany, UkSSR Academy of Sciences, Kiev]

[Abstract] The ultrastructure of Chlorella cells that develop in a multicomponent system in space flight was studied in the Akvarium [Aquarium] experiment, which was performed aboard the biosatellite Cosmos-1887 over a 13-day period in autotrophic conditions and involves a closed-loop system that consisted of a monocellular algae Chlorella vulgaris (LARG-1), aquarium fish Poecilia reticulata Pet., and the accompanying microflora. Submicroscopic cell organization was analyzed, and that of the control group was typical for Chlorella cultivated in autotrophic conditions on a mineral culture. Electron microscopic analysis of the Chlorella cells cultured in space flight in the three-component system revealed several rearrangements in the submicroscopic organization of organelles in comparison with the control groups. Reduction in the number of reserve polysaccharides was noted in cells cultured in space, as a result of accelerated hydrolytic processes in the cells in microgravitation conditions, possibly caused by changes in membrane permeability. Specific rearrangements noted in the multicomponent system, namely the appearance of Chlorella cells infected with bacteria, indicate reduction of Chlorella resistance or increased pathogenicity of bacteria in space. Figures 1, references 6: 4 Russian, 2 Western.

UDC 574.4+630.161

Method of Predicting Grain Harvest Size From Dendrochronological Data

907C0088A Sverdlovsk EKOLOGIYA in Russian No 3, May-Jun 89 (Manuscript received 19 Jul 88) pp 15-23

[Article by Ye. A. Vaganov, Institute of the Forestry and Timber imeni V. N. Sukachev, Siberian Division, USSR Academy of Sciences]

[Abstract] For areas which suffer from drought, grain harvest levels vary from year to year by 30-40% or more, as a function of weather conditions. Agricultural weather forecasts, however, are usually based on multiple regression models of the relationship of harvest level to the leading climate factors in a region and, as a rule, include quantitative estimates of temperature, precipitation, and lack of moisture that apply to the growing season only and that cannot be used for long-term forecasts. Little data exists on seasonal or five-year-plan forecasts of harvest, because the actual time series for harvest levels are short, and it is difficult to identify patterns that repeat over time. The work reported in this article attempts to remove some of the limitations that are based on the duration of those time series by studying the growth of trees in similar conditions in a given region and correlating tree growth dynamics and grain harvest size. Data from spring wheat harvests are linked to growth data for the common pine (*Pinus sylvestris* L.) in the steppe zone of the southern part of Krasnoyarskiy Kray. The method also holds promise in that it can be used to predict fluctuations in harvest size on the basis of combined agro- and dendrochronologic models. Such models would be based on the construction of dendroscales for various species of woody plants growing in grain harvest areas. The method can also be used for perennial-like species such as the larch or the birch and the aspen. Figures 8; References 4: 3 Russian, 1 Western.

UDC 635.64:632.934

Polystimulin-K as Free-Radical Lipid Oxidation and Plant Cold-Stress Resistance Regulator

907C0088B Moscow DOKLADY VSESOYUZNOY ORDENA LENINA I ORDENA TRUDOVOGO KRASNOGO ZNAMENI AKADEMII SELSKOKHOZYAYSTVENNYKH NAUK IMENI V. I. LENINA in Russian No 5, May 89 (Manuscript received 11 Oct 88) pp 5-7

[Article by O. I. Kolosha, L. G. Velikozhon, V. A. Ryaboklyach, Institute of Plant Physiology and Genetics, Ukrainian Academy of Sciences]

[Abstract] Low temperatures reduce harvest levels and often kill plants on a massive scale. Plants react to changing temperature conditions by restructuring their metabolic processes—including the free-radical oxidation of membrane lipids—which causes accumulation of hydroperoxides and malonic dialdehyde in plant tissues. Laboratory studies were performed with tomato plants to determine the influence of a synthetic cytokinin analog called polystimulin-K on leaf accumulation of hydroperoxides and malonic dialdehyde and on the resistance of plants to low temperatures. The preparation was found to promote germination when it was applied in doses of 25-50 mg/l; it provided frost-resistance in doses of 50-100 mg/l. In general, polystimulin-K, which was produced at the Moscow Institute of Chemical Technology imeni Mendeleyev, was found to lower the rate of free-radical oxidation of lipids and decrease the accumulation of cytotoxins, thereby increasing plant resistance, expanding adaptive capabilities, and increasing the survival rate and the resistance to low-temperature damage. References 7 (Russian).

UDC 577.21:578.85/.86

Creation of Transgenic Nicotiana Tabacum Plants Resistant to Potato X Virus

907C0252B Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 309 No 5, Dec 89 (manuscript received 27 Mar 89) pp 1241-1244

[Article by V. M. Zakharyev, R. Z. Gizatullin, O. A. Shulga, V. S. Katkov, N. O. Kalinina, M. E. Talyanskiy, USSR Academy of Sciences Corresponding Member I. G. Atabekov, and K. G. Skryabin, Institute of Molecular Biology imeni V. A. Engelgardt, USSR Academy of Sciences, Moscow; Moscow State University imeni M. V. Lomonosov]

[Abstract] Transgenic strains of Nicotiana tabacum were constructed that displayed increased resistance to potato X virus (PVX). The approach consisted of the introduction of the viral gene responsible for PXV surface protein into N. tabacum, where it functioned under the control of a carrot promoter. The gene was represented by cDNA incorporated into a plasmid and subsequently integrated into agrobacterium LA4404 DNA. In the following stages, N. tabacum leaf disks were transformed and then used for plant regeneration. Testing of resistant plants identified the target DNA in the plant genome by the Southern blot technique, while immunoblotting revealed a 22 kD PXV protein (vs. 26 kD for the native protein.) These observations also suggest that transgenic potatoes may be constructed by similar means that would offer greater resistance to PXV. Figures 3; references 15: 1 Russian, 14 Western.

UDC 612.822.1+577.112.083

Cloning cDNA Fragment of Human Brain Kainate Receptor

907C0250B Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 309 No 3, Nov 89 (manuscript received 20 Mar 89) pp 745-748

[Article by T. M. Smirnova, Ye. A. Orlova and S. A. Dambinova, Scientific Research Institute of Experimental Medicine, USSR Academy of Medical Sciences, Leningrad]

[Abstract] Previously prepared cDNA of human brain kainate receptor was employed in a search for genes coding for glutamate-binding proteins (GBP) using brain autopsy materials. An RNA fraction (F15) was identified in the total poly(A)RNA fraction of the human cortex which, on injection into Xenopus laevis oocytes, led to changes in membrane potential after addition of glutamate to the suspension. These observations were taken as evidence that F15 contains mRNA involved in the synthesis of kainate-type glutamate receptors. Consequently, the cDNA preparation under consideration appears to be a segment of the gene coding for kainate-class glutamate receptor. Figures 4; references 15: 3 Russian, 12 Western.

Antioxidant Properties of Proanthocyadin Isolated from Camel's Thorn

907c0076A Tashkent MEDITSINSKIY ZHURNAL UZBEKISTANA in Russian No 4, Apr 89 (manuscript received 22 Dec 87) pp 57-58

[Article by N. S. Bashirova, Z. A. Khushbaktova, Z. Kh. Shadiyeva, A. I. Usmankhodzhayeva, N. V. Olkhovaya and V. N. Syrov, Tashkent Order of the Red Banner of Labor Institute of Postgraduate Medicine; Institute of Chemistry of Plant Substances, Uzbek SSR Academy of Sciences]

[Abstract] Proanthocyadin (PAC) isolated from camel's thorn has been shown to possess hypolipidemic and antisclerotic properties. In order to assess its full therapeutic potential, studies were undertaken to assess the effects of PAC on lipid peroxidation. The trials were conducted on 2.5-3.0 kg male chinchilla rabbits with experimental myocardial infarction induced by ligation of the left descending coronary artery, with experimental animals pretreated with PAC (10 mg/kg/day; s.c.) for 3 days. Analysis of ischemic cardiac tissue in control animals after 24 hours showed that diene conjugates of unsaturated fatty acids increased 106.4%, accompanied by a 56.5% increase in serum samples. Pretreatment with PAC reduced the levels of the diene conjugates by 50.4 and 50.0% in the heart and serum samples, respectively. PAC was also shown to reduce the levels of malonic dialdehyde in the damaged myocardium and serum by 54.1 and 30.2%, respectively. Trials with ionol pretreatment were generally less impressive, demonstrating that PAC was a more efficient antioxidant. These observations, in conjunction with in vitro confirmation, demonstrated that PAC is an effective agent in inhibiting lipid peroxidation in damaged myocardium. References 6 (Russian).

UDC 547.853'584'89

A New Type of Aza Macro-Rings with Pyrimidine Fragments

907C0035a Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR: SERIYA B—GEOLOGICHESKIYE, KHIMICHESKIYE I BIOLOGICHESKIYE NAUKI in Russian No 8, Aug 89 pp 54-58

[Article by V. M. Cherkasov, I. A. Grafova, N. A. Kapran, E. A. Romanenko, Institute of Colloid Chemistry and Water Chemistry, UkSSR Academy of Sciences, Kiev]

[Abstract] Multifunctional macro-rings, especially aza macro-rings that contain amide groups are very important at the present time because of the higher complexing ability of these compounds and donor functional groups in comparison to traditional crown esters. Aza macro-rings are potential biologically active substances with a wide spectrum of effects and are regarded as analogs of some naturally occurring cyclic antibiotics. Production of aza macro-rings which have the pyrimidine ring in the periphery is studied, with consideration for the special role of pyrimidine derivatives in biological processes. Figures 4, references 7: 1 Russian, 6 Western.

UDC 577.158.54

Firefly Luciferase: Kinetics and Regulation Mechanism

907C0034 Moscow BIOKHIMIYA in Russian Vol 54 No 5, May 89 pp 734-739

[Article by N. N. Ugarova, Department of Chemical Enzymology, Chemistry Faculty, Moscow State University]

[Abstract] Firefly luciferase, a regulatory enzyme, is interesting in terms of its mechanism of action and the regulation of enzymatic activity. Interesting results were obtained in studying the luminescent properties of a native luciferin-luciferase system and comparing them with the luminescent properties of other systems. Bioluminescence is caused by radiating the chromophore, which gives off either yellow-green or red light, depending on its ionization and microenvironment. Analysis of the oxyluciferin properties in various microsystems demonstrated migration of the product via the enzyme and dissociation of the enzyme-product complex during formation of the electronically-stimulated product. ATP is an allosteric activator of firefly luciferase. Luciferase has two allosteric centers, and the binding of ATP with them increases the affinity

of the substrate center of the enzyme for ATP. The binding constants of ATP with allosteric centers are 1000 times higher than those with the substrate center. Luciferase activity is regulated by lipids and is similar to the activity of membrane enzymes. Studying firefly luciferase using genetic engineering methods was begun, and the firefly mRNA was studied for its activity in synthesizing luciferase in the histolysate of reticulocytes and frog oocytes. Figures 7, references 16: 8 Russian, 8 Western.

UDC 577.352.336:576.314

Structural Alterations of Human Erythrocyte Membranes During Interaction with Positively Charged Liposomes

907C0036b Moscow BIOLOGICHESKIYE MEMBRANY in Russian Vol 6 No 5, May 89 pp 516-529

[Article by V. I. Chernyshov, T. R. Smekhova, Yu. S. Tarakhovskiy, V. L. Borovyagin: Structural Alterations of Human Erythrocyte Membranes During Interaction with Positively Charged Liposomes]

[Abstract] Increased attention of model systems of the liposome and cell is due to feasibility of using the liposome in practical medicine. The dynamics of sorbtion of the liposomes and their subsequent inclusion in the erythrocyte membrane were explained, and the sequence of stages of altering the ultrastructure of the plasma membrane and shape of the cells that arise during incubation of erythrocytes with phosphatidylcholine-octadecylamine liposomes were determined. The liposomes were prepared from egg phosphatidylcholine mixed with octadecylamine. The erythrocytes incubated from 1-60 seconds as well as the control group consisted mainly of diskocytes. In erythrocytes incubated 1-3 minutes, numerous invaginations of the stomatocytes formed. Following incubation of the erythrocytes and liposomes for 3-5 minutes, most of the stomatocytes turned into spherocytes. It was demonstrated that incubating human erythrocytes with phosphatidylcholine liposomes is accompanied by rapid adsorption of liposomes on the cell surface, and that most adsorption occurs during the first few seconds of incubation. Reasons for the structural alterations observed are discussed.

UDC 577.352.465

Bacteriorhodopsin as a Molecular Current Source

907C0036a Moscow BIOLOGICHESKIYE MEMBRANY in Russian Vol 6 No 5, May 89 pp 507-515

[Article by G. T. Guriya, Yu. K. Krasnov, S. K. Chamorovskiy: Bacteriorhodopsin as a Molecular Current Source]

[Abstract] Bacteriorhodopsin performs proton transport through a membrane from the cytoplasmic side to the periplasmic side and is induced by absorbing a quantum of light. Equations are presented which associate the size of the trans-membrane flow of protons with light intensity, chemical potentials of hydrogen ions on different sides of the membrane, and structural parameters of the latter. A physical model is presented including assumptions and equations. The approach developed in this study is useful in analyzing proton transport in other protein membranes that are similar to bacteriorhodopsin in structure. Experiments designed to verify adequacy of the proposed theoretical approach are discussed.

UDC 577.212.3:575.42].08

Transfer of Agrobacterial Gene of Cytokinin Biosynthesis Into Tobacco Plants

907C0205C Moscow MOLEKULYARNAYA GENETIKA, MIKROBIOLOGIYA I VIRUSOLOGIYA in Russian No 7, Jul 89 pp 11-13

[Article by V. M. Yusibov, G. P. Pogosyan, V. M. Andrianov and E. S. Piruzyan, Institute of Molecular Genetics, USSR Academy of Sciences, Moscow]

[Abstract] One of the problems associated with the engineering of transgenic plants stems from the lack of cloned genes of higher plants that code for economically beneficial traits. At the same time, the genes of bacteria with known functions—such as the genes 1 and 2 of the T-DNA of Ti-plasmids of Agrobacterium tumefaciens, which are responsible for the synthesis of auxin, and gene 4, for the synthesis of cytokinin—can easily be cloned and introduced into higher plants. A system that was previously developed by the authors for the transfer of genes into a plant and that involves the use of vector plasmid pGK5 and an Ri-plasmid-helper (which is advantageous in the regeneration of transgenic plants) was used to produce Samsun variety Nicotiana tabacum transgenic plants into which was introduced and expressed the cytokinin biosynthesis gene from T-DNA of A. tumefaciens Ti-plasmid. After demonstrating the presence of gene 4 in the genome of the transgenic plants, the authors found the cytokinin level in one of the transgenic lines to exceed that in control plants by 40 percent, indicating expression of the introduced ipt gene from T-DNA of Ti-plasmid. This was the first production of phenotypically normal transgenic tobacco plants harboring the cytokinin synthesis ipt gene (gene 4) from T-DNA of A. tumifaciens T-plasmid. Figures 3; references 15: 3 Russian; 12 Western.

UDC 615.33.012.6

Ways of Developing First and Second Generation Biocatalysts for Antibiotic

907C0040a Moscow ANTIBIOTIKI I KHIMIOTERAPIYA in Russian Vol 34 No 5, May 89 pp 337-343

[Article by P. S. Nys, A. V. Sklyarenko, P. L. Zaslavskaya, Yu. E. Bartoshevich: Ways of Developing First and Second Generation Biocatalysts for Antibiotic Production]

[Abstract] The development of second generation biocatalysts and immobilized enzymes and cells is expanding the perspectives for using bioengineering systems. Approaching the cells only as an enzyme source is illogical because all of the advantages of the cellular structure are not used. Highly effective catalysts of biotransformation processes were developed by using the enzyme in situ. E. coli cells which produce penicillinamidase, an enzyme being used in transforming beta-lactam antibiotics, were selected as the object of research. The cells were embedded in polyacrylamide gel after being modified in a monomer solution by cross-linking with a bifunctional reagent. A new way of developing highly effective biocatalysts by modifying cells to alter the permeability of the cellular wall is suggested for creating free access of the substrate to intracellular enzymes and removing other substances from the cell. Two different methods of modifying E. coli cells were developed, and further development of studies on enzymology engineering led to developing second generation biocatalysts using immobilized enzymes and/or cells. These second generation biocatalysts directly produce cephalexin and are used for accelerating biosynthesis of biologically active substances by joint immobilization of the product and enzymes of metabolism, as well as for other purposes. Using immobilization methods on cells produces highly effective monoenzymatic biocatalysts and stable biosynthetic systems. Production of antibiotics can also be accelerated.

Departmental Approach to Environmental Problems

907c0032 Moscow MEDITSINSKAYA GAZETA in Russian 4 Jun 89 p 3

[Article by G. Akatov, chief expert, USSR State Committee for the Environment, under the rubric "Departmental Approach": "We Live in Freedom"]

[Abstract] The lives of some forty million city dwellers in the USSR are at risk because of air pollution. Water samples taken from 200 major rivers have shown that only 21% are free of dangerous levels of bacterial and viral pathogens. The basic problems lie in the fact that the various industrial ministries have not made a serious effort in enforcing industrial waste treatment regulations, in retrofitting plants with pollutant-controlling devices, or in construction of clean-operation plants. At best, only lip service is paid to environmental concerns, while the economic reality of building a new plant more cheaply and in improving the bottom line takes precedence over environmental health concerns. As a result, morbidity due to adverse environmental factors has been steadily increasing in the USSR. The facts indicate that the various ministerial department themselves will have to get seriously involved in controlling environmental pollution if real progress is to be made. Short-term stop-gap measures or inadequate cosmetic improvements will no longer suffice to alleviate legitimate concerns and demands for improvement.

Azov Sea Pollution

907C0002A Moscow MEDITSINSKAYA GAZETA in Russian 28 May 89 p 2

[Article by B. Gertsenov, TASS correspondent, special for MEDITSINSKAYA GAZETA, Donetsk, under the rubric "Ecological Situation" : "And Again the Sea Is Under Lock and Key"]

[Abstract] Decades of sanitary neglect, urbanization and industrial overdevelopment have now made it necessary to forbid swimming on beaches of the Azov Sea because of dangerous levels of pollution, a situation that affects the vacation plans of workers at fifteen industrial plants in the area. Despite warnings from health authorities and efforts of the labor unions, no telling measures have been made to control waste discharge into the sea, to expand the capacity of existing waste treatment facilities, or to construct new facilities. The author suggests that the time has come for a concerted cooperative effort to save the recreational, health, and ecological resources that the Azov Sea environment represents present and future generations.

UDC 616.972-036.15:616-097

Late Occult Syphilis in AIDS Patient

907c0079 Kiev VRACHEBNOYE DELO in Russian No 7, Jul 89 (manuscript received 13 Jul 89) pp 113-115

[Article by A. F. Frolov, S. V. Fedorchenko, M. G. Vaskovskaya, D. Ya. Golovchenko, V. M. Kisilevskiy and B. G. Kogan, Scientific Research Institute of Epidemiology and Infectious Diseases imeni L. V. Gromashevskiy; Chair of Dermatovenereology, Medical Institute, Kiev]

[Abstract] A case study is presented of a 35-year-old native of Equatorial Africa who tested positive for antibodies against HTLV-III on 17 Dec 87. Prior to April 87, the patient was in good health. At that time, the patient started to develop subfebrile temperature elevations in the evening, nonproductive cough, chest pains, purplish spots on the soles of the feet, and other progressive manifestations of AIDS. These included T-cell lymphopenia and generalized Kaposi's sarcoma. In addition, conventional serological workup yielded 4+ Wasserman and Kahn tests, indicating concomitant occult syphilis.

UDC 616.97-097

Serological Testing of the Uzbek Population for AIDS (1987-1988)

907C0386B Tashkent MEDITSINSKIY ZHURNAL UZBEKISTANA in Russian No 9, Sep 89 pp 7-8

[Article by Sh. Sh. Shavakhabov, M. N. Rizayev, V. R. Pulatov, and R. M. Ruzybakiyev, Tashkent Branch, USSR Ministry of Health Institute of Immunology, Tashkent]

[Text] Acquired immune deficiency syndrome (AIDS) constitutes a new epidemic form of immunological deficiency induced by a virus.[4, 6] According to WHO data, the total number of AIDS patients in the world by the end of 1988 exceeded 140,000 and the number of persons infected by the virus had reached 5-10 million.

Epidemiological studies in the USSR attest to the rapid increase in the number of infected persons. The epidemiology of the first HIV infection entry in the USSR has been described; as a result of that entry, 15 persons, including a child, became infected. The first case of HIV-2 infection in the USSR was recently reported.[3] Two new cases of the penetration of HIV infection into the USSR have been detected—one in which the infection was transmitted by a woman to her child through breast-feeding, and one in which the transmission was from a woman to a man via heterosexual contact.[2]

The real threat of AIDS coming to the UzSSR led to the opening of the Uzbekistan AIDS Testing Laboratory and testing laboratories in the oblasts of the Kara-Kalpak ASSR in 1987. The organizational and methodological work was headed by the Tashkent branch of the USSR Ministry of Health Institute of Immunology. The present report cites the first results of the testing of the population of the republic for HIV via enzyme immunoassay (EIA).

More than 869,000 serological tests for AIDS virus antibodies were performed in 1987-1988 by the republic's AIDS laboratories with the domestically produced Peptoskrin, Antigen, and Vektor test systems, and there were 119 positives (see Table). Foreigners accounted for 64.7% of the persons with positive results, homosexuals 2.1%, persons with venereal diseases 10.2%, persons engaged in promiscuous sexual relations 3.4%, and persons suspected of having AIDS 5.0%

Results of Serological Testing for AIDS in the UzSSR (as of December 1988)

Contingent of examined persons	Number of examined persons	Number of EIA seropositive (after second testing)	Number of positives confirmed by immunoblotting	Frequency, %
Risk group	42,528	31	-	-
Foreigners	7,938	77	7	0.0089
Pregnant women	276,495	2	-	-
Blood donors	454,186	-	-	-
Healthy individuals	27,847	3	-	-
Suspected AIDS patients	49,661	6	-	-
Total	869,109	119	7	0.0008

All of the persons who tested positive in EIA were checked by a confirmatory test (immunoblotting, Dupont) at the USSR Ministry of Health Institute of Immunology and the Scientific-Research Institute of Epidemiology and Microbiology imeni N. F. Gamaleya, USSR Academy of Medical Sciences. HIV infection was confirmed in seven persons. All seven persons were foreign citizens who had come for study (six women from African countries and a man from Panama). All of the seropositive HIV persons were young (19 to 26 years old), with characterisitically active sexual behavior.

The high percentage of false positives (94.1%) obtained by using the diagnostic test systems should be noted. The Vektor test system yielded false positives in 100% of the cases, as a result of which its use was halted in 1988.

The high percentage of false EIA positive test results has been noted by many investigators[1,5] and is associated with the presence of culture-cell membrane antigens in the antigen material of the test kit as a result of inadequate removal of the antigen or anti-erythrocyte antibodies. In that connection, test systems with synthetic

HIV envelope or core (env or core) peptides, particularly, Peptoskrin) should be recognized as quite promising for mass screening procedures.[1]

The results of the serological testing of the republic's population in 1987-1988 allow us to presume that AIDS virus infection in the UzSSR is at the subthreshold level, since the principal groups of healthy persons, including blood donors, are virtually free of HIV infection. At the same time, the detection of even a low, but reliable seropositive level dictates the need for the most vigorous serological screening of the population for HIV in the UzSSR.

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UDC 616-006.04:312.2(47+57)

Basic Patterns of Mortality in the USSR Due to Malignant Neoplasms

907C0095 Leningrad VOPROSY ONKOLOGII in Russian Vol 35 No 6, Jun 89 (manuscript received 29 Jun 88) pp 649-657

[Article by N. P. Napalkov and V. M. Merabishvili, Order of Red Banner of Labor Scientific Research Institute of Oncology imeni Professor N. N. Petrov, USSR Ministry of Health, Leningrad]

[Text] The overall mortality index dropped from 18.0 to 9.8 per 1,000 population in the USSR between 1940 and 1986,[7] whereas even lower mortality rates were recorded in the USSR in certain of the last 25 years—the lowest figure (6.9/1000) being recorded in 1964.[8]

A study of the trends in mortality rates of for 23 countries revealed that in virtually all of them, the mortality rate among males due to tumors of all localizations has, to varying degrees, increased; at the same time, a rise in mortality rate among women due to neoplasms was established in only 6 countries.[9]

An analysis of the basic patterns of USSR mortality rates associated with malignant neoplasms was performed on the basis of data collected in the 1960's and 1970's by the USSR Central Statistical Administration and on data on USSR mortality rates published by the USSR State Committee for Statistics for 1985. For tumors of the main sites, standardized indicators were calculated, indexed evaluation was made, and a number of special statistical procedures and methods were used. Also, extensive use was made of indices of dynamic series, and determination was made of the statistical reliability of differences between the compared figures.

In the Soviet Union, as in many economically developed countries, mortality due to malignant tumors is in second place among all causes of death, although in some parts of the country, the mortality rate due to malignant tumors has a lower rank.

From 1960 to 1986, the USSR mortality rate associated with malignant neoplasms rose to 155.2/100,000 from 115.5,[2] or by 34.4%, whereas oncological morbidity rose at a faster rate, which led to a significant gap between those indicators. The faster rise in USSR morbidity associated with malignant neoplasms, as compared with mortality due to the same cause, plus the advances made in the treatment of oncological patients, was instrumental in the dramatic increase in the number of patients under observation at oncological institutions—2,833,000 people as of 1 January 1987, according to data of the USSR State Committee for Statistics.[5, 6]

It is important to note that over the last 25 years, the rise in mortality was uniform for the first two decades (averaging 1% per year); however, the rate of increase in mortality due to malignant tumors in the last 5 years rose to 1.5% per year. The substantial increase in rate of growth in mortality due to malignant tumors can be attributed to two circumstances: first, to the faster rise in the growing oncological morbidity rate for this period; and, second, to the substantial change in structure of USSR mortality due to malignant neoplasms toward an increase in the percentage of tumors characterized by a less favorable outcome—primarily, lung cancer.

Table 1 presents the structure of USSR mortality due to malignant neoplasms, and it shows that, as before, neoplasms of digestive organs are in the lead (43.5%) among causes of oncological mortality; however, their percentage in the overall structure of mortality due to malignant tumors has dropped appreciably, and the percentage of cancer of the stomach has dropped to one-half its prior level over the 25 years.[4] There was a substantial rise, to 22.7% from 13.3, in the percentage of deaths due to tumors of respiratory organs, mainly because of lung cancer, the percentage of which virtually doubled. There has also been a redistribution in the structure of mortality rate associated with malignant neoplasms because of the rise in the incidence of rectal and uterine cancer, while there was a significant decline in the incidence of cervical cancer.

Table 1. Structure of USSR Mortality Rate Associated With Malignant Neoplasms*

	Years					
Tumor site	**1960**	**1965**	**1970**	**1975**	**1980**	**1985**
All malignant neoplasms	100.0	100.0	100.0	100.0	100.0	100.0
Mouth and throat	—	1.0	1.3	1.5	1.9	2.2
Digestive organs	59.9	55.1	51.6	48.6	44.8	43.5
Including:						
esophagus	5.9	5.9	5.0	4.4	4.0	3.6
stomach	40.5	35.7	32.0	28.4	23.8	20.8
rectum	1.9	2.1	2.9	3.9	4.6	5.2
Respiratory organs	13.3	15.3	17.0	18.7	20.9	22.7
Including:						
bronchi, trachea, lung	11.9	13.8	15.3	16.7	18.5	20.1
Bones and connective tissue	—	1.2	1.0	1.1	1.1	1.4
Skin	0.4	0.5	0.6	0.8	1.0	1.0
Breast	2.5	3.2	4.0	4.8	5.5	5.8
Female reproductive organs	9.5	9.5	9.4	8.9	8.7	8.1
Including:						
cervix uteri	7.7	3.8	3.9	3.6	3.3	2.7
Male reproductive organs	—	1.2	1.4	1.5	1.6	1.8
Including:						
prostate gland	—	0.9	1.2	1.2	1.3	1.5
Urinary organs	—	2.8	3.2	3.3	3.6	3.9
Lymphatic and hemopoietic tissues	4.7	5.5	5.8	5.7	5.4	5.4
Leukemia and aleukemia	—	3.2	2.9	3.3	3.1	3.1

*Napalkov, N. P. et al., VOPR. ONKOL., 1977, No 1, p 6;[4] VESTN. STATISTIKI, 1981, No 11, p 72;[1] SOV. ZDRAVOOKHR., 1988, No 1, pp 66-67.[7]

Let us examine the basic patterns in the dynamics of USSR mortality rates associated with tumors of the principal sites (Table 2). While there was a general rise in oncological mortality, there was a statistically reliable decline in the incidence of cancer of the stomach from 46.8/100,000 in 1960 to 31.3/100,000 in 1985, or by 33.1%; in cancer of the esophagus from 6.9/100,000 to 5.5, or by 20.3%; and in cancer of the cervix from 8.9/100,000 to 4.1, or by 53.9% ($p < 0.01$). The mortality indicators rose for the other groups of neoplasms. The most substantial rise in USSR mortality over the 25 years is noted for rectal cancer—a 3.5-fold increase, or an average of 10.2% per year ($p < 0.001$). There was a threefold rise in mortality due to breast cancer and skin cancer, although its base level was relatively low (0.5/100,000). There was a 2.2-fold rise in mortality due to lung cancer, the annual annual increment being 4.8% for the period in question.[7]

Table 2. USSR Mortality Rate Due to Malignant Neoplasms at Individual Sites

	Number of deaths due to malignant neoplasms											
	1960		1965		1970		1975		1980		1985	
	Absolute number (thousands)	Per 100,000	Absolute number (thousands)	Per 100,000	Absolute number (thousands)	Per 100,000	Absolute number (thousands)	Per 100,000	Absolute number (thousands)	Per 100,000	Absolute number (thousands)	Per 100,000
All malignant neoplasms (including malignant neoplasms of lymphatic and hemopoietic tissue)	247.5	115.5	284.9	123.6	308.7	127.2	342.3	134.5	371.8	140.0	417.6	150.6
Mouth and throat	—	—	2.9	1.2	3.9	1.6	5.2	2.0	7.0	2.6	9.0	3.3
Digestive organs	148.4	69.2	157.0	68.1	159.3	65.6	166.2	65.4	166.6	62.8	181.7	65.6
esophagus	14.8	6.9	16.8	7.3	15.4	6.4	15.0	5.9	15.0	5.7	15.2	5.5
stomach	100.3	46.8	101.6	44.1	98.8	40.7	97.3	38.3	88.5	33.3	86.8	31.3
intestine	—	—	8.6	3.7	10.1	4.4	13.4	5.3	16.6	6.3	20.6	6.4
rectum	4.7	2.2	6.1	2.6	9.2	3.8	13.3	5.2	17.1	6.4	21.6	7.8
Respiratory organs	33.1	15.4	43.6	18.9	52.6	21.6	63.9	25.1	77.8	29.3	95.0	34.3
trachea, bronchi, lung	29.5	13.8	39.4	17.1	47.2	19.5	57.1	22.4	68.8	25.9	84.1	30.4
Bone and connective tissue	—	—	3.5	1.5	3.2	1.3	3.9	1.5	4.2	1.6	5.7	2.1
Skin	1.1	0.5	1.5	0.6	2.0	0.8	2.8	1.1	3.5	1.3	4.3	1.6
Breast	6.2	2.9	9.0	3.9	12.3	5.1	16.3	6.4	20.3	7.6	24.2	8.7
Female reproductive organs	23.4	10.9	27.1	11.7	28.9	11.9	30.6	12.0	32.2	12.2	33.9	12.2
cervix	19.1	8.9	10.9	4.7	12.1	5.0	12.5	4.9	12.1	4.6	11.4	4.1
Male reproductive organs	—	—	3.5	1.5	4.4	1.8	5.0	2.0	6.0	2.2	7.4	2.7
prostate gland	—	—	2.7	1.2	3.6	1.5	4.2	1.7	5.0	1.9	6.3	2.3
Urinary organs	—	—	8.0	3.5	9.8	4.0	11.4	4.5	13.3	5.0	16.1	5.8
Lymphatic and hemopoietic tissue	11.7	5.4	15.8	6.8	17.8	7.3	19.4	7.6	20.0	7.4	22.6	8.1
leukemia and aleukemia	—	—	9.1	3.9	9.0	3.7	11.2	4.4	11.6	4.3	12.9	4.6

Table 3 shows the dynamics of mortality rates for males and females in the USSR in ordinary and standardized indicators, and it gives the ratio of male mortality to female mortality. As can be seen in this table, the entire increment of oncological mortality is attributable to the rise in the rate in males. In females, the rise in mortality due to malignant tumors is entirely related to the increase in the percentage of middle-aged and elderly individuals. Moreover, female mortality due to malignant tumors by comparison with the baseline level shows a statistically reliable decline of 10%; however, it has in fact been unchanged since the mid-1970's (Figure 1). The rise in male mortality is related mainly to the increase in lung cancer, which is why the overall ratio of male oncological mortality to female oncological mortality has also risen. Evaluation of standardized male and female mortality indicators shows that the mortality rate among males due to malignant tumors is now twice as high as that for females.

Table 3. Male and Female Mortality in USSR Due to Malignant Neoplasms

	Ordinary indicators			Standardized indicators		
Years	Male	Female	M:F	Male	Female	M:F
1960	119.7	112.1	107	160.3	100.2	160
1965	130.7	117.6	111	164.9	96.6	171
1970	137.4	118.4	116	166.5	92.3	179
1975	146.6	124.1	118	168.0	91.2	184
1980	156.8	125.7	125	170.7	88.3	194
1985	173.2	130.8	132	183.7	90.2	203
Increment 1960-1985,%	44.7	16.7	23	14.6	-10.0	26.9
Average annual increment	1.8	0.7	0.9	0.6	-0.4	1.1

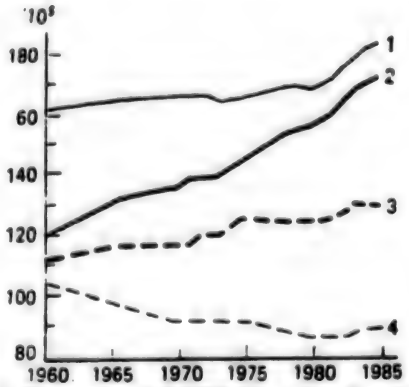

Figure 1. Dynamics of USSR Mortality Due To Malignant Neoplasms

Key: 1. standardized indicators of male mortality 2. ordinary intensive indicators of male mortality 3. ordinary intensive indicators of female mortality 4. standardized indicators of female mortality. *x* axis—years

The age-sex distribution of male and female oncological mortality rates as related to all causes of death, listed in Table 4, shows that neoplasms constitute the highest percentage among causes of death in males between the ages of 45 and 74 and in females between the ages of 35 and 69; in the distribution of these indicators, malignant tumors are more important in the mortality structure for younger females than for males; however, it must be borne in mind that the submitted figures refer only to percentages, and not to incidence, and the percentages were calculated for different bases. Nevertheless, in the above age groups, malignant tumors are the cause of death in every fourth or fifth male death and in virtually every third female death.

Table 4. Percentage of USSR Deaths Due to Malignant Neoplasms Among All Causes of Death in 1985 for Each Age Group. Compiled on the Basis of Statistical Data Provided by the USSR State Committee for Statistics.

	Age groups, years										
Sex	0	1-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	75 or older	Totals
Male	0.28	3.26	11.13	5.25	5.10	10.74	20.80	26.87	20.74	9.21	15.78
Female	0.30	2.99	12.71	11.52	18.38	27.08	29.08	27.25	16.74	5.72	12.66

Table 5 presents the incidence of malignant tumors for each age-sex group, and it furnishes an idea about the nature of the age-related distribution of tumors of the main sites. The highest levels of mortality due to individual forms of malignant tumors among males are associated with the age of 75 years or older. The mortality rate among males 75 or older constitutes 62.0/100,000 for cancer of the esophagus, 280.2/100,000 for cancer of the stomach, 54.2 and 72.6/100,000 for colon and rectal cancer, 33.9/100,000 for cancer of the larynx, 377.0/100,000 for lung cancer, 49.4/100,000 for cancer of the prostate and 25.0/1000,000 for leukemia. In females, the highest mortality rates are also in the group 75 or older. The rates according to site are as follows: cancer of the esophagus 25.2/100,000, stomach cancer 139.0/100,000, colon cancer 42.9/100,000, rectal cancer 42.6/100,000, lung cancer 45.6/100,000, cervical cancer 32.1/100,000 and leukemia 11.9/100,000. The highest mortality rates among USSR women due to breast cancer belong to the age group of 55-64 years (44.2/100,000).

Table 5. Age-Related USSR Mortality Rate (per 100,000) Due to Malignant Neoplasms in 1985

	Age groups											Standardized indicator	
Tumor site	0	1-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	75 or older	Total	European standard	International standard
1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Both sexes												
Malignant neoplasms, total	7.5	8.5	6.3	8.3	18.1	62.7	203.3	460.2	728.3	715.2	150.6	173.7	124.1
Lips, mouth, throat	0.1	0.1	0.1	0.2	0.3	1.9	6.1	10.5	11.8	13.5	3.3	3.8	2.7
Esophagus	0.0	—	0.0	0.0	0.1	1.2	7.2	17.2	26.5	34.3	5.5	6.4	4.4
Stomach	0.1	0.0	0.1	0.3	2.5	12.0	39.5	90.1	166.7	174.2	31.3	36.1	25.1
Colon	0.0	0.1	0.0	0.1	0.6	1.8	6.2	16.2	36.1	45.7	6.4	7.4	5.0
Rectum, rectosigmoid junction, anus	—	0.0	0.0	0.2	0.9	2.5	7.8	20.7	44.6	50.1	7.8	9.0	6.2
Larynx	0.0	—	0.0	0.0	0.1	1.5	6.0	11.9	11.7	7.7	3.1	3.6	2.6
Trachea, bronchi, lung	0.1	0.1	0.1	0.3	1.1	8.7	47.2	116.2	146.5	97.6	30.4	35.3	25.2
Breast	—	0.0	0.0	0.1	1.4	7.5	16.6	27.0	30.9	33.2	8.7	10.2	7.4
Leukemia	3.2	3.3	2.7	2.1	1.9	2.7	5.1	10.1	15.9	12.3	4.6	5.0	4.3
Other malignant neoplasms of lymphatic and hemopoietic tissue	0.8	1.0	0.9	1.3	1.9	2.3	4.8	9.1	11.8	9.8	3.5	3.9	3.1
Other sites	3.2	3.9	2.4	3.6	6.2	17.2	47.7	108.8	170.7	177.7	36.5	41.9	30.4
	Males												
Malignant neoplasms, total	8.2	9.3	7.4	9.2	17.3	67.8	270.5	690.8	1200.2	1181.1	173.2	262.6	185.3
Lips, mouth, throat	0.0	0.1	0.1	0.2	0.4	3.4	11.6	22.3	27.3	27.4	5.4	7.8	5.6
Esophagus	0.0	—	0.0	0.0	0.1	1.9	12.0	31.8	50.4	62.0	7.5	11.7	8.0
Stomach	0.1	0.0	0.1	0.3	2.5	15.7	59.6	142.2	269.8	280.2	37.0	56.9	39.3
Colon	0.0	0.1	0.1	0.2	0.6	2.0	6.8	17.6	45.1	54.2	5.4	8.7	5.9
Rectum, rectosigmoid junction and anus	—	0.0	0.0	0.2	0.7	2.3	7.9	24.2	59.1	72.6	7.0	11.3	7.7
Larynx	0.1	—	0.0	0.0	0.2	2.9	12.3	28.3	33.9	25.9	6.1	8.8	6.3
Trachea, bronchi, lung	0.1	0.1	0.1	0.3	1.6	15.1	90.5	254.3	377.0	263.5	53.7	81.0	57.4
Mammary gland	—	—	—	0.0	0.0	0.1	0.5	1.1	2.2	2.9	0.3	0.5	0.3
Prostate gland	—	—	0.0	0.1	0.1	0.3	2.0	11.1	49.4	95.3	4.9	8.7	5.5
Leukemia	3.6	3.6	3.0	2.4	2.0	2.7	5.7	13.1	25.0	22.8	5.1	6.6	5.4
Other malignant neoplasms of lymphatic and hemopoietic tissue	0.9	1.3	1.4	1.7	2.2	2.8	6.6	12.7	17.7	17.7	4.2	5.5	4.4
Other sites	3.4	4.1	2.6	3.8	6.9	18.6	55.0	132.1	243.3	256.6	36.6	55.1	39.3
	Females												
Malignant neoplasms, total	6.8	7.6	5.2	7.2	18.8	57.8	143.8	307.3	521.6	560.6	130.8	126.0	90.4
Lips, mouth, throat	0.2	0.0	0.0	0.1	0.2	0.5	1.2	2.6	5.0	8.9	1.4	1.3	0.9
Esophagus	—	—	0.0	0.0	0.1	0.5	3.0	7.4	16.1	25.2	3.7	3.5	2.3

Table 5. Age-Related USSR Mortality Rate (per 100,000) Due to Malignant Neoplasms in 1985 (Continued)

Tumor site	Age groups											Standardized indicator	
	0	1-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	75 or older	Total	European standard	International standard
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Stomach	0.0	0.0	0.0	0.3	2.5	8.5	21.8	55.5	121.5	139.0	26.3	24.6	16.9
Colon	0.0	0.0	0.0	0.1	0.6	1.7	5.6	15.2	32.2	42.9	7.3	6.7	4.6
Rectum, rectosigmoid junction and anus	—	—	0.0	0.2	1.0	2.7	7.6	18.4	38.2	42.6	8.5	8.0	5.5
Larynx	—	—	—	0.0	0.0	0.1	0.4	1.1	1.9	1.6	0.4	0.4	0.3
Trachea, bronchi, lung	0.0	0.0	0.0	0.2	0.6	2.5	8.8	24.7	45.6	42.6	9.8	9.3	6.5
Breast	—	0.0	0.0	0.1	2.8	14.6	30.9	44.2	43.5	43.3	16.2	16.6	12.2
Cervix	—	0.0	0.0	0.1	1.5	4.6	9.3	20.3	32.1	24.9	7.8	7.7	5.6
Uterus and other undefined sites	—	—	0.0	0.1	0.6	1.9	6.2	16.3	25.6	22.2	5.9	5.7	4.1
Leukemia	2.8	3.0	2.3	1.8	1.8	2.6	4.5	8.1	11.9	8.8	4.2	4.2	3.6
Other malignant neoplasms of lymphatic and hemopoietic tissue	0.7	0.7	0.5	1.0	1.5	1.7	3.2	6.7	9.2	7.2	2.9	2.9	2.3
Other sites	3.1	3.9	2.4	3.2	5.6	15.9	41.3	86.8	138.8	151.4	36.4	35.1	25.6

Table 6 presents the indexes of ratios of male to female standardized indicators of mortality due to malignant neoplasms for 1960-1985, which show that males die 8.5 times more often of lung cancer, 6 times more often of neoplasms of the mouth and throat, 3.6 times more often of esophageal cancer, twice as often of stomach cancer and neoplasms of bones and connective tissue, and 1.5 times more often of neoplasms of lymphatic and hemopoietic tissue.

Table 6. Indexes of Ratios of Male to Female Standardized* Indicators of Mortality Due to Malignant Neoplasms in Males and Females as a Function of Different Sites**

Tumor site	Years					
	1960	1965	1970	1975	1980	1985
All malignant neoplasms	160	160	179	184	194	203
—mouth and throat	—	350	362	437	537	611
—digestive organs	172	178	188	215	196	201
—including:						
—esophagus	219	242	263	268	293	363
—stomach	176	185	201	211	220	234
—rectum	104	108	109	123	129	137
Respiratory organs	567	696	737	759	821	852
—trachea, bronchi, lung	564	680	719	757	807	859
Bones and connective tissue	—	277	170	190	180	179
Tumors of lymphatic and hemopoietic tissue	156	161	166	165	162	164
—leukemia and aleukemia	—	129	152	146	147	151

*Standard according to M. Segi.[10]

**Standardized mortality rate indicators for females are taken as 100.

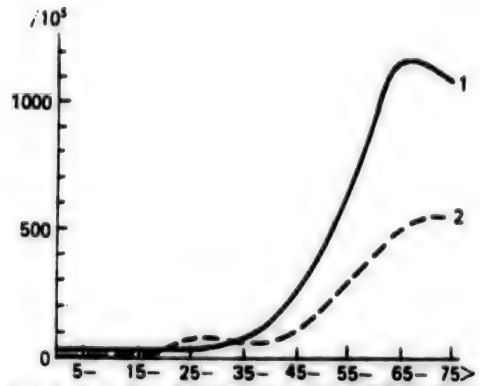

Figure 2. Age-Sex Distribution of USSR Indicators of Mortality Rates Associated With Malignant Neoplasms (all forms—140-208) in 1985

Key: 1. males—2. females. *x* axis—age, in years

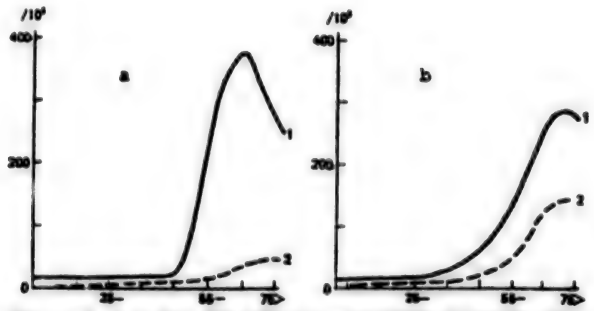

Figure 3. Age-Sex Distribution of USSR Mortality Due to Cancer of the Lungs (a) and Cancer of the Stomach (b) in 1985

Key: 1. males—2. females. *x* axis—age, in years

Resumption of publication of age-sex indicators for mortality rate and, particularly, for neoplasms should help in deeper and constant statistical monitoring of morbidity rates associated with malignant neoplasms.

The age-sex distribution of mortality rates in the USSR as a whole for all malignant neoplasms and the main sites is illustrated in a series of graphs (Figures 2, 3, 4). Age-related grouping conforms to WHO recommendations for distribution of mortality rates. The mortality rate indicators for Union republics (Table 7) are scaled to the European standard for age-related distribution of population.

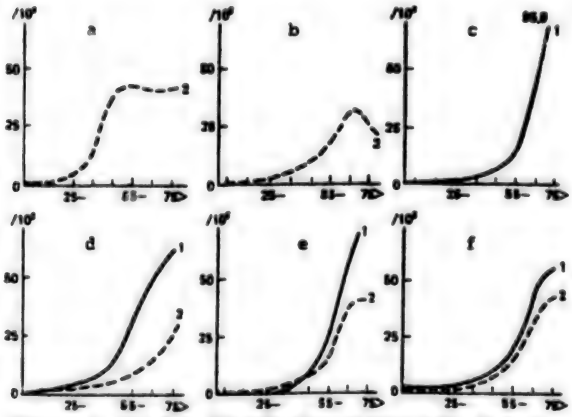

Figure 4. Age-Sex Distribution of Mortality Due to Malignant Neoplasms of the Breast (a), Cervix (b), Prostate Gland (c), Esophagus (d), Rectum (e), and Colon (f) in 1985

Key: 1. males—2. females. *x* axis—age, in years

Table 7. USSR and Union Republic Mortality Rates in 1986*

	Standardized mortality indicators (European standard)		Percentage of malignant neoplasms in overall structure of mortality	
Union republics	Males	Females	Males	Females
Entire USSR	272.5	130.7	18.0	14.9
RSFSR	302.3	137.1	19.1	15.8
Ukrainian SSR	258.8	126.4	17.5	14.5
Belorussian SSR	249.7	117.5	17.7	14.7
Uzbek SSR	169.5	104.1	13.3	11.6
Kazakh SSR	291.5	142.5	20.3	18.0
Georgian SSR	153.5	92.5	11.6	11.6
Azerbaijan SSR	217.9	110.7	15.7	13.5
Lithuanian SSR	255.1	133.2	19.2	17.4
Moldavian SSR	208.3	116.3	12.2	9.9
Latvian SSR	277.4	141.7	18.3	16.3

Table 7. USSR and Union Republic Mortality Rates in 1986* (Continued)

	Standardized mortality indicators (European standard)		Percentage of malignant neoplasms in overall structure of mortality	
Union republics	Males	Females	Males	Females
Kirghiz SSR	196.3	104.9	14.6	12.5
Tajik SSR	142.8	88.2	13.2	11.3
Armenian SSR	167.9	97.9	15.8	14.0
Turkmen SSR	208.5	132.1	13.6	12.2
Estonian SSR	289.9	139.0	18.7	15.9

*Calculated according to "Zdravookhraneniye v SSSR" [Health Care in the USSR], Moscow, 1988, pp 35-36.

In order to obtain the more customary indicators according to the international standard, which are used extensively in statistics of oncological morbidity, we can recommend that the conversion factor 0.71 plus or minus 0.07, by which the indicator calculated for the European standard must be multiplied. The same table lists our estimates of percentage of malignant neoplasms in the overall structure of mortality for males and females in each Union republic. The highest percentages of malignant tumors as cause of death among males are in the Kazakh SSR (20.3%), Lithuanian SSR (19.2%) and RSFSR (19.1%); for females they are in the Kazakh SSR (18.0%), Lithuanian SSR (17.4%) and Latvian SSR (16.3%). The lowest indicators for males and females are in the the Moldavian SSR (12.1 and 9.9%, respectively) and among the inhabitants of the Central Asian republics.

Our broad-scale comparative investigations of oncological morbidity and mortality covering the period of the last census, which included all administrative territories of our country (for the main tumor sites), revealed that there are more than 35 oblasts and autonomous republics where the correlation of those parameters, particularly among the middle-aged, indicate that poor records are kept of new cases of malignant neoplasms.[3] The number of deaths due to stomach cancer exceeded the number of cases in 26 oblasts, and in 23 oblasts that was typical of lung cancer.

Establishment of oblast- and autonomous republic-level centralized records of routine charts (form 030-6/U) used in dispensary observation of patients with malignant neoplasms, extensive use of computers in dispensary supervision, monitoring adequacy of all diagnostic and therapeutic procedures with assessment of their efficacy could help in further improvement of statistics on mortality due to malignant tumors.

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UDC 579.252.5:633.7

Cloning Sequences of Bacterial Plasmids from the Genome of Nicotiana Debneyi Plant Cells Transformed With Microinjections of DNA

907C0028a Moscow GENETIKA in Russian Vol 25 No 5, May 89 (manuscript received 10 Oct 88) pp 799-808

[Article by V. V. Argentova, V. M. Andrianov, E. S. Piruzyan, Institute of Molecular Genetics, USSR Academy of Sciences, Moscow]

[Abstract] When foreign genetic information is injected into plant genomes by no matter what method, researchers must determine how much of that genetic information remains unaltered when inserted exogenous DNA is incorporated in the genome of a plant cell. One of the most well-developed vector systems for transforming plants is the system of transferring genes using Agrobacterium plasmids. Interested in precisely how exogenous DNA are incorporated into plant genome DNA with the DNA microinjection method, which was developed and used for plant cells, the researchers here performed a detailed study of the structural organization of foreign DNA in the plant cell genome. They studied the T-DNA/plant DNA splicing site by using "marker rescue" to clone in E. coli cells the plasmid DNA/genome plant DNA splicing site from the genome of lines of transgenic plants produced in the transformation of the DNA of the pGV0319 plasmid and to analyze integration of pGV0319 into the genome. The structures of these plasmids were studied using restriction and hybridization analyses. Marker rescue consists in the fragmenting of the genome plant DNA with the appropriate restrictase, ligation with the formation of ring molecules of DNA, and transformation back into E. coli. Such "rescued" plasmids bear a homology both with the initial plasmid DNA and the genome DNA of Nicotiana debneyi. "Rescued" plasmids were compared with the original pGVO319 to ascertain whether plant DNA was in the "rescued" clones. Sequencing of the plant/plasmid DNA splice needs to be performed and compared with the nucleotide sequence of the original pGVO319 plasmid to find the precise location of the recombinant section. Analysis showed that when DNA of the pGVO319 plasmid was introduced into the N. debneyi genome, part of the plasmid was lost following microinjection. Regions of the pGV0319 plasmid that carry markers selective for plants, however, were found in the transgenic plants virtually unchanged, without any appreciable restructurings. Figures 5, references 13: 4 Russian, 9 Western.

UDC 579.842.23:579.25]:575.116.12

Cloning and Study of the Functioning of Yersinia Pestis recA-Like Gene in the Cells of Intestinal Bacilli

907C0037C Moscow MOLEKULYARNAYA GENETIKA, MIKROBIOLOGIYA I VIRUSOLOGIYA in Russian No 5, May 89 (manuscript received 5 May 88; after revision, 19 Aug 88) pp 34-39

[Article by I. Yu. Suchkov and B. N. Mishankin, Scientific Research Antiplague Institute, Rostov-na-Donu]

[Abstract] RecA proteins, a product of the recA gene in Escherichia coli, participate in general genetic recombination, SOS-system regulation in the cell, UV-induction of the prophage λ, reactivation of UV-radiated phages, the process of transcription of genetic information, and regulation of cellular pressure. There is no information about the recA gene in Y. pestis in the literature. The relatively high level of Y. pestis resistance to UV radiation and a tendency of the microbe towards induced mutagenesis in the presence of the mucAB-gene plasmid indicate that a recA-like system operates in Y. pestis. The purpose of this study was to molecularly clone the Yersinia pestis recA-like gene and study its ability to complement the defect of recA-gene E. coli in repairing, recombining, and inducing the synthesis of bacteriocins using pesticin I and colicin E1. The data obtained demonstrate that the product of the cloned recA-like gene of the agent can de-repress bacteriocin synthesis. It is believed that the recA protein of Y. pestis is similar in its enzyme activity to that of the recA protein in E. coli.

UDC 577.113+123.5

Production and Possible Usage of Reengineered Genetic System of Corn Mitochondria

907C0091 Novosibirsk IZVESTIYA SIBIRSKOGO OTDELENIYA AKADEMII NAUK SSSR: SERIYA BIOLOGICHESKIKH NAUK in Russian No 1, Apr 89 (Manuscript received 10 Oct 88) pp 18-21

[Article by Yu. M. Konstantinov, V. A. Podsosonnyy, G. N. Lutsenko, Siberian Institute of Physiology and Biochemistry of Plants, Siberian Division, USSR Academy of Sciences, Irkutsk]

[Abstract] Attempts to use intact mitochondria and mitochondrial DNA as a vector system in experiments involving the transfer of genes to the cells of animals have shown that whole organelles are preferable for such purposes. The transplantation of isolated organelles to

plant protoplasts is also considered a promising method of genetic transformation. Based on such experiments, researchers judge that there is a need for effective techniques for inserting recombinant DNA into isolated plant mitochondria. One way of solving the problem is to use reengineered membrane systems, i.e., to divide membrane components and subsequently restore membrane structures and their innate functions. Until recently, the genetic system of plant mitochondria was never studied in this manner. The research reported in this article studies the properties of the reconstructed genetic system of corn mitochondria by investigating the kinetic parameters of synthesis of RNA and DNA in proteoliposomes produced by self-assembly involving gel filtration of the solubilized material from the mitochondria of corn sprouts through Sephadex LH-20 to form mitosomes with RNA- and DNA-synthesizing activity. The mitochondria were taken from three-week-old blanched corn sprouts of the hybrid Krasnodarskiy 303 TV. The researchers used a mild detergent to prevent appreciable loss of enzymatic activity during the solubilization. Their method turned out to be quick, easily reproducible, and promising for the study of the structural and functional organization of plant mitochondrial genomes and for genetic and cellular engineering of plants. Figures 3; References 11: 6 Russian, 5 Western.

UDC 576.356:582.282.195.23

Production of High Polyploidy Saccharomycetes by Destabilization of Sex (III) Chromosome

907C0252A Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 309 No 5, Dec 89 (manuscript received 10 Mar 89) pp 1230-1233

[Article by S. A. Bulat, O. V. Sokolova and I. A. Zakharov, Leningrad Institute of Nuclear Physics imeni B. P. Konstantinov, USSR Academy of Sciences, Gatchina, Leningrad Oblast]

[Abstract] An overview is presented of studies designed to produce saccharomycetes with high polyploidy, relying on selective destabilization of chromosome III (sex chromosome) incorporating a 2 μm segment of plasmid DNA in the presence of free copies of the plasmid. Destabilization disturbs the genetic information of chromosome III and the cells manifest α or "a" phenotype, i.e., they are capable of efficient crossing. This method led to the development of octaploid and higher ploidy saccharomycetes. Biochemical studies suggest that decaploid forms may be obtained that may equal diploid saccharomycetes in stability. Furthermore, it appears that even higher polyploids may be constructed through recombinant DNA technology, a development of obvious interest to biotechnology. References 4; references 14: 4 Russian, 10 Western.

UDC 579.842.11:579.252.55].083.1

Cloning and Expression of New Class of Tetracycline-Resistance Determinant in Escherichia Coli Strains

907C0205A Moscow MOLEKULYARNAYA GENETIKA, MIKROBIOLOGIYA I VIRUSOLOGIYA in Russian No 7, Jul 89 pp 3-7

[Article by O. V. Parfenova, L. A. Anisimova and A. M. Boronin, Institute of Biochemistry and Physiology of Microorganisms, USSR Academy of Sciences, Pushchino, Moscow Oblast]

[Abstract] DNA-DNA homology is the principal trait according to which tetracycline-resistance determinants ("tet-determinants") are classified. Known tet-determinants of endobacteria are divided in to five classes—A, B, C, D, and E—and the tet-operons of those classes are expressed in aerobic as well as anaerobic growing conditions. The tet-determinant of the gram-negative anaerobe Bacteriodes fragilis is expressed in E. coli under aerobic conditions only, which is why it has been placed into class F. The researchers here present data on the cloning of the tet-determinant of the pBS221 plasmid (isolated from Pseudomonas aeruginosa) as part of the multicopy pUC19 vector and on its expression in strains of E. coli. The determinant was expressed under aerobic conditions and anaerobic conditions, coding for two proteins—a 27 kD repressor protein and a 36 kD protein providing antibiotic resistance—although nucleotide sequences were different. Blot hybridization experiments showed that the determinant is not homologous to tet-determinants of known classes. The determinant represents a new class, G. The tet-operon of this new class is found in many Serratia marcescens strains. Figures 3; references 16: 4 Russian; 12 Western.

UDC 57.085.23:577.214.625

Effects of Eukaryotic Promoters on Expression of cDNA of Human TPA in Human Cell Culture

907C0250A Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 309 No 3, Nov 89 (manuscript received 20 Mar 89) pp 721-724

[Article by S. B. Aleshkov, M. B. Ustav and A. A. Bayev, academician, Tartu State University; Institute of Molecular Biology imeni V. A. Engelgardt, USSR Academy of Sciences, Moscow]

[Abstract] An analysis was conducted on the expression of cDNA of human TPA (tissue plasminogen activator) in a human cell line under the control of a series of eukaryotic promoters. Brief description is provided of the construction of appropriate vectors for the infection of HeLa S3 cells, a system that does not produce TPA. Determination of TPA synthesis showed that the promoters ranked as follows in terms of decreasing expression of the TPA gene: early SV40 promoter g moloney leukemia virus LTR g Rous sarcoma virus LTR g

monkey sarcoma virus LTR g herpes simplex type I virus thymidine kinase promoter. Western blot analysis demonstrated that the infected HeLa S3 cells produced a 62,000-65,000 D protein that reacted with TPA antibodies. Figures 1; references 8 (Western).

UDC 579.836.11:579.252.5].08

Cointegrate Formation Between Plasmid pAS8-1213 and One of Plasmids of Azospirillum Brasilense Sp245

907C0205B Moscow MOLEKULYARNAYA GENETIKA, MIKROBIOLOGIYA I VIRUSOLOGIYA in Russian No 7, Jul 89 pp 8-10

[Article by V. Yu. Matveyev, L. P. Petrova, Ye. A. Zhuravleva and V. I. Panasenko, Institute of Biochemistry and Physiology of Plants and Microorganisms, USSR Academy of Sciences, Saratov]

[Abstract] The researchers here study the behavior of plasmid vector pAS8-1213 in Azospirillum brasilense Sp245 cells and the use of this vector to mobilize one of the plasmids of strain Sp245. The plasmid proved to be incapable of autonomous replication into the new host, but could integrate into genetic structures of Azospirillum with high frequency. Electrophoretic analysis revealed the presence of the cointegrate in 90-95 percent of Km^R-transconjugates of Sp245. The obtained cointegrate pAS8-1213::pAbSP245c, thanks to the stability of its maintenance in E. coli strain DH1 and A. brasilense 75, may be used to construct a physical map of plasmid pAbSP245c and in the search for segments ensuring interaction of Azospirillum genus bacteria with plants. Figures 3, references 23: 5 Russian, 18 Western.

UDC 579.252.5:577.21

UV Inducibility of LT-toxin Operon

907C0205D Moscow MOLEKULYARNAYA GENETIKA, MIKROBIOLOGIYA I VIRUSOLOGIYA in Russian No 7, Jul 89 pp 29-35

[Article by I. G. Tiganova, O. Yu. Rusina, I. V. Andreyeva, V. V. Demkin, G. V. Brukhanskiy, G. I. Aleshkin, A. G. Skavronskaya, Scientific Research Institute of Epidemiology and Microbiology imeni N. F. Gamileya, USSR Academy of Medical Sciences, Moscow]

[Abstract] UV light is a classical inducer of SOS regulation—a system whose functioning is associated with processes such as reparation of DNA damage and induced mutability—with induction taking place in the genetic material itself or in direct relation to DNA metabolism. The authors here have shown that UV light may induce functions of a different nature, including some which determine survival of cells under unfavorable conditions not directly involving DNA. Previously, that was demonstrated in connection with the degree of expression of tetracycline resistance, the function of the plasmid tet-operon. This report contains data concerning UV induction of another operon (elt), whose function is not associated with DNA metabolism. In one series of experiments, the authors attempted to identify UV induction of the LT-toxin by performing a comparative immunological determination of the quantity of LT-toxin produced by intact and UV-irradiated cells carrying plasmid pVZ357. The plasmid elt-operon pVZ14 was produced by fusing the elt-operon of the plasmid pVZ357 with the lac gene of the bacteriophage Mud I (Amp, Lac). Fusion of the lacZ gene with an elt-promoter by loss of toxin production coded by pVZ357 and acquisition of Lac' phenotype by pVZ14 containing cells as well as by HindIII pVZ357 and pVZ14 fragments hybrid with the labelled elt-probe was demonstrated. The dynamics of beta-galactosidase synthesis in E. coli cells harboring pVZ14 showed an elt-operon to have pronounced constitutive activity and to be activated by the SOS-inducing agent, UV light. Figures 2; references 21: 5 Russian; 16 Western.

UDC 575.086:835.004.14

Transformation of Leaf Explantates of Tobacco and Cotton and Slices of Potato Tubers With a Binary Agrobacterium Vector System

907C0028B Moscow GENETIKA in Russian Vol 25 No 5, May 89 (manuscript received 18 Mar 88; in final form, 1 Aug 88) pp 946-949

[Article by O. E. Makarova, N. N. Kuznetsova, S. S. Nuridzhanyants, S. A. Abdukarimov, K. G. Skryabin, Institute of Molecular Biology imeni V. A. Engelgardt, USSR Academy of Sciences, Moscow; Institute of Bioorganic Chemistry, Uzbek Academy of Sciences, Tashkent]

[Abstract] Conditions for transforming individual organs of plants (leaves and tubers) on various strains of agrobacteria were determined, and the feasibility of using recombinant and binary vectors was studied. The selective marker used was the neomycin phosphotransferase II (NPTII) gene, which provides cellular resistance to kanamycin for Nicotiana tabacum, v. Samsun, the object of the transformation. Leaves of sterile plants were chopped up and chemically treated. Expression of the transferred gene in the leaves was determined by the ability to form callouses in a culture with kanamycin. The agrobacterium strains varied in their transformation ability. Figures 1, references 6: 1 Russian, 5 Western.

UDC 56.858.9

Transducing Capability of Phage CP51 Mutants Virulent For Bacillus Cereus Group Bacteria

907C0206A Moscow GENETIKA in Russian Vol 25 No 6, Jun 89 pp 1013-1020

[Article by N. G. Koretskaya, O. Ye. Svetoch, S. B. Khachaturyan and A. P. Dobritsa, All-Union Scientific Research Institute of Applied Microbiology, Moscow Oblast]

[Abstract] A study of the possibility of using phage CP51 mutants for transduction described production of such mutants and characteristics of their transducing activity. Processing virulent phage CP51, which is used to transfer chromosomal and plasmids markers between Bacillus cereus group bacteria, provided isolation of mutants with reduced viability and ts-mutants of this phage. Some of the mutants obtained increased the effectiveness of tranduction and simplified performance of the process. Transfer frequencies of plasmid pBC16 by phage CP51-26 and phage CP51-4-59 reached 5×10^{-4} per plaque-forming unit and 4.5×10^{-3} per bacterial cell, respectively. Isolation and use, for transduction, of the more stable ts-mutant, which kills bacterial cells, but cannot multiply in them at non-permissive temperature, may provide conditions under which, with a plurality of infection of 1-1.5 and higher initial titers of the bacteria and phage, a significant part of the surviving cells will themselves be transducers for one marker or another. Figure 1; references 19: 3 Russian; 16 Western.

UDC 578.262:579.871.8

Comparative Characteristics of Group of Closely Related Bacteriophages of Methanol Oxidizing Bacteria Acetobacter Methanolicus

907C0206B Moscow GENETIKA in Russian Vol 25 No 6, Jun 89 pp 1021-1028

[Article by B. Kiesel, L. Wunsche, V. Z. Akhberdyan, V. Z. Khrenova, V. A. Gerasimov, and V. N. Krylov, Institute of Biotechnology, Leipzig, GDR; All-Union Scientific Research Institute of Genetics and Selection of Industrial Microorganisms, Moscow]

[Abstract] A comparative study of four new phages (Acm2, Acm5, Acm6 and Acm7) and a phage previously known as MO1 (phage Acm1), specific for methanol oxidizing bacteria of the Acetobacter methanolicus species, was described and discussed. All five phages are closely related and have identical morphology and sizes of phage particles. All differ in their host range. The phages belong to group A according to the Bradley classification and have a 70 nm diameter icosahedral head, a neck, a collar with fibers, a contractile tail (73 +/- 2 nm) ending in a basal plate with fibers. Genomes of the Acm phages are permuted and presented as double-stranded DNA of 60 kbp. Heteroduplex analysis and DNA-DNA hybridization showed that the level of similarity of nucleotide sequences of Acm phage DNAs exceeds 95 percent. The Acm phages are serologically related. A defective prophage homologous to Acm phages is found in the bacterial chromosome. Figures 4; references 11: 1 Russian; 10 Western.

UDC 616.61-002.3-036.12-085.37

Immunocorrective Action of Sodium Nucleinate in Complex Therapy of Chronic Pyelonephritis

907C0190B Alma-Ata ZDRAVOOKHRANENIYE KAZAKHSTANA in Russian No 6, Jun 89 pp 35-37

[Article by T. Z. Seysembekov, V. A. Snopkova and B. K. Aytpayev, Department of Introductory Internal Medicine No 2 and Department of Microbiology, Karaganda Medical Institute]

[Abstract] Earlier studies showed that chronic pyelonephritis is accompanied by deficiency of a number of immun ameters. The immunocorrective action of sodium nucleinate (NaNuc) was investigated on 23 pyelonephritis patients; all were treated with standard therapy including antibacterial agents and with NaNuc (0.4 g twice a day for 10-16 days). All patients showed improvements in clinical and laboratory indices: increased levels of leucocytes and lymphocytes in peripheral blood, increased number of neutrophils reacting to exogenous stimulation, increased average content of T-lymphocytes, increased IgG level and somewhat decreased level of O-lymphocytes. Humoral factors of nonspecific resistance did not change; spontaneous activation of neutrophils diminished, but remained elevated in comparison to controls. Overall, it was concluded that during treatment of chronic pyelonephritis, NaNuc exhibited the capacity for normalization of a number of immune parameters, acting through the system of T-lymphocytes and neutrophils. Hence a recommendation was made for its introduction into clinical application. References 4 (Russian).

UDC 616.329-006.61-02:615.277.4.015.4:615.361.438-02

Thymogen Inhibition of N-Nitrososarcosine Ethyl Ester Carcinogenesis in Rat Esophagus and Forestomach

907C0122 Kiev EKSPERIMENTALNAYA ONKOLOGIYA in Russian Vol 11 No 4, Jul-Aug 89 (manuscript received 18 Jul 88) pp 23-26

[Article by V. G. Bespalov, D. N. Troyan, A. S. Petrov, V. G. Morozov, V. Kh. Khavinson, V. I. Deygin and V. A. Aleksndrov, Scientific Research Insitute of Oncology imeni prof. N. N. Petrov, USSR Ministry of Health, Leningrad]

[Abstract] Thymogen, a synthetic analog of thymolin, was tested for its effects on N-nitrosoarcosine ethyl ester-induced esophageal and forestomach tumors in 120-130 g outbred male rats. The animals received the carcinogen per os in a dose of 100 mg/kg/day for 8 weeks, followed by daily subcutaneous administration of 10 μg thymogen for 32 weeks. Comparison of thymogen-untreated control rats with the thymogen-treated rats demonstrated that tumor incidence in the latter was 12.2% lower, while tumor multiplicity was 1.5- to 1.7-fold lower. Treatment of the carcinogen-exposed rats with pulmotin, a preparation derived from bovine alveoli and devoid of activity on the immune system, had no effect on the outcome. Histologic examinations revealed that the tumors consisted primarily of papillomas, with occasional carcinomas. The beneficial effects of thymogen were attributed to its enhancement of the immune system, since many carcinogens are known to be immunosuppressive. References 12: 11 Russian, 1 Western.

Laser Treatment of Myocardial Infarction

907C0073a Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 30 Sep 89 p 2

[Article by correspondent N. Kvizhinadze: "Laser Against Infarction"]

[Text] Methods of treating various forms of cardiac ischemia with a helium-neon laser were developed and introduced into clinical practice at the Georgian Ministry of Health's Scientific Therapy Research Institute.

The innovation was used for the first time on a patient with an acute myocardial infarction who had been revived from clinical death several times in the course of 3 days and whose condition was deemed to be hopeless. Fibrillation ceased after the very first laser therapy session, and disturbance of the cardiac rhythm disappeared completely after 3 days of irradiation. Since then these methods, which are unique in world practice, helped to return over a thousand patients back to their feet and prevent many deaths. It was established that a laser acts upon practically all pathogenic factors of cardiac ischemia, and that it is several times more effective than traditional treatment methods. The research showed that laser therapy has no contraindications and side effects, that it is technically simple, and that it is available for wide introduction.

UDC 617.51-001-06:616.831-001-085.849.19-036.8-07:[616.89+616.831-073.97

Psychopathological and Electroencephalogram Correlation in Patients

907C0039a Moscow ZHURNAL NEVROPATOLOGII I PSIKHIATRII IMENI S.S. KORSAKOVA in Russian Vol 89 No 5, May 89 pp 37-41

[Article by G. Ya. Anishchenko, I. G. Dallakyan, T. A. Dobrokhotova, O. I. Speranskaya, A. A. Potapov: Psychopathological and Electroencephalogram Correlation in Patients with Craniocerebral Trauma Following Laser Therapy]

[Abstract] Low-intensity helium-neon lasers can be used therapeutically due to their unique properties which are suitable for treating patients with craniocerebral trauma. The dynamics of neurological and psychopathological syndromes following laser therapy in various regimens were studied in the early rehabilitation period. Changes in EEG indices during laser therapy were determined. Therapeutic change with respect to the hemisphere afflicted was explained. The patients were divided into groups by type of craniocerebral trauma and treated with different laser therapy regimens depending on the type of craniocerebral trauma. Laser therapy accelerates regression of neurological and psychopathological manifestations of severe craniocerebral trauma, making it one of the most perspective methods for treating craniocerebral trauma. Effectiveness depends on the type and location of the lesion, general symptoms, and therapy regimen selected.

UDC 577.391.616.006.621.375.8

Photosensitized Inactivation of HeLa Tumor Cells by Phthalocyanines

907C0160c Moscow RADIOBIOLOGIYA in Russian Vol 29 No 3, May-Jun 89 (manuscript received 27 May 88) pp 353-358

[Article by T. Y. Karu, L. V. Pyatibrat and G. S. Kalendo, Scientific Research Center of Technological Lasers, USSR Academy of Sciences, Troitsk; All Union Scientific Oncology Center, USSR Academy of Medical Sciences, Moscow]

[Abstract] Some porphyrins accumulate selectively in solid tumors and are effectively used in photoradiation therapy. New photosensitizers, however, are being sought, because the hematoporphyrins (HP) most commonly used in this technique are a complex mixture that renders the technique somewhat empirical. In addition, researchers are seeking to raise the efficiency of photodestruction with photosensitizers that have an absorption band with a high extinction coefficient in the far red and near infrared regions (increasing the wavelength increases the depth of penetration of the light in the tissue). Phthalocyanines (PC), with absorption bands in the 660-680 nm range, are believed to be such photosensitizers. The goal of this work was to investigate the action of PC derivatives on HeLa cells during the exponential and stationary growth phases and to compare their effectiveness with that of HP. Two PC derivatives were studied: tetrasulfonated PC (TSPC) and chloroaluminum PC (CAPC). HeLa cells were irradiated with a copper-vapor laser (λ = 629 and 670 nm; pulse duration, 18 ns; power density, 2-9.8 x 10^3 W/m^2). The combined effect of TCPC or CAPC with laser irradiation resulted in a dose-dependent decrease of HeLa cell survival in both the exponential and stationary phases; on the basis of the trypan blue exclusion test or the colony forming ability test, TCPC and CAPC exceeded the effect of HP by two- and seven-fold, respectively. Hence, a recommendation was made to explore further the photosensitizing potential of CAPC in therapeutic use against solid tumors. Figures 2; references 9: 2 Russian, 7 Western (1 by Russian authors).

UDC 615.849.19:576.75

Effect of Low-Intensity Lasers and Hypokinesia on Enzyme Processes in Neurocytes in Rat Brain

907C0270A Minsk ZDRAVOOKHRANENIYE BELORUSSII in Russian No 8, Aug 89 (manuscript received 2 Sep 88) pp 27-30

[Article by Professor S. I. Yupatov, A. A. Turevskiy, Docent S. S. Anufrik, and Senior Research Associate S.

M. Zimatkin, Chairs of Faculty Surgery and of Histology and Embryology, Grodno Medical Institute]

[Abstract] The increasing use of low-energy lasers in medical practice led to an assessment of possible effects of such modality on brain metabolism and histology. The studies were carried out on 220 g male rats subjected to low-intensity lasers in combination with hypokinesia. In one case, red laser irradiation (LG-75, 632.8 nm wavelength, 0.5 mW/cm^2 power output, 5-10 min exposure) was combined with ultraviolet laser (LGI-21, 337 nm, 0.5 mW/cm^2, 5-10 min) for up to 15 days in conjunction with immobilization. Target areas selected for irradiation consisted of the left parietotemporal area, upper thoracic region, lumbar region, and testicles. The resultant histochemical and histologic examinations failed to reveal any significant deviations in the cortical neurons or the arcuate and ventromedial hypothalamic nuclei. The lack of effects was attributed to the low intensity of the laser and low penetrance of the cutaneous layers. References 4 (Russian).

UDC 617.-002.3-085.849.19-036.8-6

High-Intensity Lasers in Combined Therapy of Pyogenic Soft Tissue Conditions

907C026D Moscow SOVETSKAYA MEDITSINA in Russian No 8, Aug 89 (manuscript received 19 Feb 88) pp 70-74

[Article by O. K. Skobelkin, P. I. Tolstikh, V. A. Derbenev and A. V. Gertsen, Scientific Research Institute of Laser Surgery, USSR Ministry of Health, Moscow]

[Abstract] Ten years of experience with CO_2 lasers at the Institute of Laser Surgery have shown its great utility in the management of purulent conditions of soft tissues, both as a scalpel and, in the defocused mode (20 W/cm^2, 1 cm/sec scans), as a tissue stimulant and antiseptic factor. The purulent conditions that have been successfully managed with this modality have ranged from acute lactational mastitis to paraproctitis and furuncolosis. In all cases, best results were obtained in combination with immobilized proteolytic enzymes to promote clearing, drainage, and healing. References 8 (Russian).

Miniaturized Cardioanalyzer Developed

907C0175A Minsk SOVETSKAYA BELORUSSIYA in Russian 12 Nov 89 p 4

[Article: "A Gift Is Made of an Innovation"]

[Text] "Is it true that a personal cardioanalyzer has been created?"

Ya. Sergeyev, Pinskiy Rayon

This reporter learned from Cardiological Scientific Research Institute associate A. Pilipenko that a miniature cardioanalyzer developed by scientists of the Cardiological Scientific Research Institute jointly with engineers of the Elektronika Plant will help people monitor their own state.

Understanding the full significance of the local situation, the authorities decided to give victims of the Chernobyl Nuclear Power Plant disaster 100 of the new instruments free of charge.

"Mikrotron" Device for Cancer Treatment

907C0068A Leningrad LENINGRADSKAYA PRAVDA in Russian 3 Sep 89 p 1

[Article by A. Agrafenin: "Electrons Attack Disease"]

[Text] **The production of "Mikrotron" complexes is beginning at the "Ravenstvo" Association. These units are designed for the irradiation of cancer tumors and at present are the most effective means of treating oncological diseases.**

Considerable experience in the production of medical equipment has been accumulated at the "Ravenstvo" Association. More than 20 years ago it developed and began to manufacture gamma-therapeutic "Rokus" units. About 140 apparatuses were made during those years. All of them operate reliably in clinics of many countries throughout the world. According to the statement by Western specialists, their parameters surpass similar equipment of leading foreign firms.

"Rokus" units have been improved over a course of 20 years. Electronics and computer science have been widely used in recent modifications. There is no doubt that "Rokus" units could still successfully meet the needs of our medical institutions and easily compete at the world market for a long time. Nevertheless, the "Ravenstvo" Association has changed over to the production of fundamentally new complexes.

On the whole, in their size and labor intensiveness "Mikrotrons" differ little from "Rokus" units. For example, the assembly of a multi-ton unit during its series mastering will also last 1 to 1 and ½ months. Even the appearance of the two complexes is very similar.

However, in essence, the differences are tremendous. The operation of "Rokus" apparatuses is based on radioactive substances. The entire design is intended to focus a radiation beam of specific intensity in the necessary direction. However, while acting on sick cells, radioactive substances also act on healthy tissues, creating the so-called "shade effect." Other problems connected with the servicing of "Rokus" units also arise. For example, how to protect medical personnel and how to "bury" used up radiation sources?

"With the introduction of 'Mikrotrons' there will be no such problems," B. L. Kulbitskiy, director of research on medical topics at the association, says. "The complex has a different principle of operation. Instead of radioactive elements, the principle of a cyclotron accelerating and firing electrons to disease spots is used here. And if there is no radiation, there are also no dangers connected with it."

The totally different approach did not diminish, but increased significantly, the medical effectiveness of these complexes. The time of an operation has been shortened considerably and, consequently, the force of irradiation effect on healthy tissues is smaller, which, in practice, nullifies the possibility of appearance of side effects.

Thus, the new complexes will soon appear in the country's clinics. Incidentally, the "Mikrotron" model was demonstrated at the international exhibition of medical equipment in the United States. The new device evoked great interest. Many firms are ready to conclude contracts for the purchase of "Mikrotrons." Each of them costs more than 500,000 dollars. However, the "Ravenstvo" Association has not yet concluded a single deal. The reason is clear: There is also an acute shortage of such equipment in our clinics.

Automated Diagnostic Center at "Eye Microsurgery" MNTK

907C1075b Moscow VECHERNYAYA MOSKVA in Russian 27 Oct 89 p 1

[Article by V. Kucherenko: "Twenty-First Century Polyclinic: World's First Automated Diagnostic Center"]

[Text] **As a child, winding my way through the polyclinic corridors with my mother, I often dreamed, like Yemelya, of riding a magic carpet through the doctors' offices—just to do things quickly, without having to wait in line, as if by the wave of a wand. A fantasy? Only not in the Mikrokhirurgiya Glaza MNTK, where it will soon become reality.**

Unique equipment is undergoing installation in the just-erected building on Beskudnikov Boulevard.

"In this polyclinic, the patient will be relieved of the exhausting marathon through the offices of specialists," said Candidate of Medical Sciences D. Ioffe, director of the scientific consultation department. It would be sufficient for him to sit down in a chair and take off on an automated diagnostic line. It is like Fedorov's famous "daisy": There is a qualified specialist in each petal. During his journey the patient has ocular pressure measured, he is subjected to an ophthalmometric exam, his

nearsightedness and farsightedness are checked, and retinal biocurrents are determined. All of the data are fed into a computer memory on the spot. Without rising from the chair the visitor finds himself before the doctor responsible for initial reception. Analyzing the results of the examination, he determines the treatment method—surgery, or just conservative treatment.

Let me note that eight such lines will be installed in the initial reception department, making it possible to receive around 500 patients per shift. The Simens Corporation and the Cheboksary Machine Plant bid against each other for a contract to produce these "health conveyers." Our compatriots won.

Besides this, the polyclinic will also have a repeat examination department, in which leading medical personnel of the MNTK will receive those who had already undergone a course of treatment. The throughput of this department will not be inferior to the former, inasmuch as each doctor will have a personal computer connected to a data bank. None of that tiresome paperwork, none of those pedantic instructions—all disease histories are retrieved from the storehouses of the electronic memory by pressing a key.

This polyclinic will receive thousands of patients of the MNTK. The automatic system will relieve the patient of the exhausting lines, and doctors freed of tiresome office work will concern themselves with his health.

Will S. Fedorov's brain-child pay its way? The Ministry of Health did invest more than 6 million in foreign currency and 2.5 million in Soviet rubles into it, you see. It will. And not just by raising labor productivity by several orders of magnitude. Tens of thousands of people returning to life and work, and money not spent on hospital passes—these are the real impacts.

For the moment the world's first automated polyclinic will receive patients only from the Mikrokhirurgiya Glaza Intersector Complex. We will hope that this is only the "first swallow." Such establishments are needed by all of our public health, which is suffocating from the lines and the technological powerlessness. In the opinion of the MNTK's general director, today's public health allocations must be channeled primarily into such automated diagnostic centers, which will free up to a third of our country's doctors and do away with medical institutions lacking modern equipment as being no longer necessary. This in turn will make it possible to save many millions on construction of new buildings.

UDC 616.131-005.7-092.9-06:616.24-005.98-085.835.12

Effect of Hyperbaric Oxygenation, Thalamonal, and Their Combination on Pulmonary Edema in Experimental Embolism of Lesser Circle Vessels

907c0080 Moscow GRUDNAYA KHIRURGIYA in Russian No 4, Jul-Aug 89 (manuscript received 22 Mar 88) pp 36-39

[Article by G. V. Kurygin, V. V. Polikarpov and M. L. Fafurina, Yaroslavl Medical Institute]

[Abstract] Mature albino rats were employed in an assessment of the efficacy of hyperbaric oxygenation (HO), Thalamonal, and combination of these two treatment modalities in the management of embolic pulmonary edema (PE). HO (3 atm [308.98 kPa], 40 min, 10 min compression and decompression) was shown to assure 100% survival of animals after intravenous administration of olive oil (1 ml/kg over 60 sec), with marked attenuation of PE and prevention of hydrothorax, but no effect on pulmonary hyperemia. Administration of Thalamonal (0.1 ml/kg) 10 min before olive oil was moderately effective in reducing the degree of PE. Combination of HO and Thalamonal had essentially no additional effect on PE, but did mitigate the degree of pulmonary hyperemia. Trials with mechanical embolism induced by intravenous administration of 1% lycopodium suspension failed to indicate any beneficial effect of HO, Thalamonal, or their combination. The differences in the outcome of therapy in these two form of embolism were attributed to the different pathogenetic mechanisms involved. In fatty embolism, the predominant picture was one of altered vascular permeability in the lungs; while in mechanical embolism, hemodynamic perturbations were the dominant factor. References 15: 11 Russian, 4 Western.

Clinical Testing of New Blood Substitute Planned

907C0111 Kiev PRAVDA UKRAINY in Russian 4 Oct 89 p 4

[Article attributed to "Dnepr," under the rubric "After a Sensational Event": "Twelve Minutes after Death"; first paragraph is source introduction]

[Text] **Four years ago, in August 1985, in the Dnepropetrovsk Oblast Hospital imeni Mechnikov, an event took place that will surely go into the annals of the history of medicine: the life of a patient who had been clinically dead for 12 minutes was saved.**

Resuscitation specialists knew that the limit was seven minutes. If, after that, a patient came back to life, he would, as a rule, be a mere invalid. So here it was, 12 minutes! Was it not some magical force that saved the woman's life?

"Of course not," said Professor Lyudmila Vasilevna Novitskaya-Usenko, rector of the Dnepropetrovsk Medical Institute, honored Scientist of the Ukrainian SSR and head of the Department of Anesthesiology and Resuscitation. "The pharmacology committee of the USSR Ministry of Health decided that the clinic at our department should test a new blood substitute, so-called perftoran. It was developed under the direction of Feliks Fedorovich Belo yartsev at the Pushchino Institute of Biophysics of the USSR Academy of Sciences. The preparation has a surprising ability to carry life-giving oxygen through the smallest vessels to places where other blood substitutes cannot possibly penetrate."

Here's what it was like. You couldn't be seen or heard by the patient, or more accurately, the former patient!

Larisa N. is not yet 40. She is a mathematician, married and raising a school-age son. So, perftoran not only restored to life a mother and wife, but also returned a socially beneficial person to society.

"I am thankful to the scientists of the medical institute and the doctors," Larisa N. says, "for returning me from, literally, the other world. I am thankful to fate for this miraculous preparation that appeared right at that moment. Unfortunately, now they are not producing it."

True, they are not producing it. As has become clear through some recent articles in the central press, a heated and, at times, far from scientific dispute arose around perftoran. As a result of intrigue that led to the tragic death of its creator, production of the preparation was actually suspended. Without judging the correctness of the decision, let us listen to the opinion of L. V. Novitskaya-Usenko.

"Clinical tests were preceded by lengthy laboratory experimentation on animals," Lyudmila Vasilevna says. "As a result, we discovered new, heretofore unknown positive qualities of perftoran's clinical action, and we developed the techniques and dosages for its use. And only after that did we begin to administer it to extremely ill patients. Studies showed that it had no negative side effects on the human body. We succeeded in saving 10 out of 15 patients who had serious—one could say, hopeless—brain damage. Most of them are now leading active social lives. The other five, unfortunately, died because their injuries were simply too great... In short, perftoran treatment is very effective. Previously, the mortality rate from such injuries was at least 45%. I should also stress that, in addition to Larisa N., five more patients have been termed clinically dead for prolonged periods, and four of them were revived. None of them lost their fitness to work.

"Unfortunately, the suspension of clinical testing has prevented us from reviving many patients. The losses are irrecoverable. In Novosibirsk, in June, there was an All-Union Conference at which scientists—chemists, biophysicists, physiologists and doctors—discussed the current situation surrounding the development of a new blood substitute. Clinical testing of the preparation is planned to resume in early 1990. Experiments have shown that it will be considerably more effective than perftoran."

UDC 616.832.-001-085.849.11

Effect of a Constant Electromagnetic Field on Restorative Processes

907C0039b Moscow ZHURNAL NEVROPATOLOGII I PSIKHIATRII IMENI S.S. KORSAKOVA in Russian Vol 89 No 5, May 89 pp 41-44

[Article by E. V. Tkach, A. N. Abilova, Sh. M. Gazalieva: Effect of a Constant Electromagnetic Field on Restorative Processes Following Spinal Cord Traumas]

[Abstract] A hypothesis of the importance of the demarcation potential that arises following spinal cord traumas in forming the spinal cord scar and feasibility of affecting it using a constant magnetic field along the spinal cord is presented. The spinal cord was severed in white rats in the upper thoracic region. The rats were then placed in solenoids with varying induction fields for varying lengths of time on a daily basis. The rats treated with the magnetic fields had a 56

likelihood of regaining movement of the rear paws, as opposed to control rats which did not regain motility. The therapy was then used on humans, and demonstrated an increase in restoration of motility and sensory functions in contrast to patients treated without magnetic field therapy. The magnetic field reduces scarring and accelerates nerve growth, restoring motility.

UDC 616.831-005.98-092.9-085.835.3

Hyperbaric Oxygenation in Toxic Edema of the Brain

907C0039c Moscow ZHURNAL NEVROPATOLOGII I PSIKHIATRII IMENI S.S. KORSAKOVA in Russian Vol 89 No 5, May 89 pp 57-62

[Article by M. V. Romasenko, P. B. Kazakova: Hyperbaric Oxygenation in Toxic Edema of the Brain]

[Abstract] The morphologic picture of toxic edema of the brain caused by triethylols and the effects of hyperbaric oxygenation on it were studied using Chincilla rabbits. They were administered triethylols daily for three days, at which time edema of the brain appeared. They were then divided into a control group and group treated with hyperbaric oxygenation. At the time of sacrifice, the condition of the rabbits that had been treated had improved somewhat. The brains of both groups of rabbits were examined and appearances described in detail. Comparative histological analysis showed reduced edema of brain tissue and reparation of vessels, neurons, and glia. The positive influence of hyperbaric oxygenation extends beyond just correcting edema to stimulating reparation of nerve tissues. The function of the ion pump is restored, which helps the nerve cells eliminate excess water and changes associated with it. Hyperbaric oxygenation is very effective and recommended for treating edema of the brain of varying etiologies.

UDC 616.833.115-089.168-059:615.844]-036.8

Results of Direct Electrostimulation of Injured Optic Nerves In Neurosurgical Patients

907C0086A Moscow ZHURNAL VOPROSY NEYROKHIRURGII IMENI N. N. BURDENKO in Russian No 3, May-Jun 89 pp 17-20

[Article by V. A. Khilko, B. V. Gaydar, M. I. Kondratyeva, I. M. Nikolskaya, Ye. I. Usanov, A. N. Shandurina, A. G. Shchitov, Military-Medical Academy imeni

S. M. Kirov; Scientific Research Institute of Experimental Medicine, USSR Academy of Medical Sciences, Leningrad]

[Abstract] A method of direct electrical stimulation of damaged optic nerves in neurosurgical patients is reported. The method was tested between January 1981 through February 1986 in the treatment of 111 patients aged 12-58 after surgery for tumors or inflammatory pathology with resultant optic nerve trauma. A theraupeutic effect is achieved in many patients who have partial or complete loss of vision if treatment is initiated within no more than 3-4 months. In patients with partial trauma or compression of the optic nerve in the canal, the method should be used within a few days to a week after the craniocerebral injury. The use of the method improves the reliability, speed and extent of improvement of vision in patients operated on for tumors of the optic chiasm region. References 5: Russian.

UDC 616.13/14-089.28-07

Experimental and Clinical Trials with Novel Soviet Vascular Prostheses with Diminished Thrombogenic Potential

907c0078 Kiev KLINICHESKAYA KHIRURGIYA in Russian No 7, Jul 89 (manuscript received 11 Apr 88) pp 22-25

[Article by A. A. Spiridonov, V. V. Satmari, A. A. Zaporozhan, Yu. A. Grozovskiy, M. B. Ilyina, S. P. Novikova, A. B. Shekhter and N. B. Dobrova, Institute of Cardiovascular Surgery imeni A. N. Bakulev, USSR Academy of Medical Sciences, Moscow; Kishinev Medical Institute]

[Abstract] Preliminary trials with caudal veins of dogs demonstrated that Vitalin (carbon fiber) and conventional heparinized Flurolon-Lavsan vascular prostheses retained their patency for 3-5 years. Histological studies revealed the absence of marked dystrophic changes, because of adequate vascularization and a continuous lining coat of endothelium. Clinical trials with these prostheses on 93 patients showed retention of patency for the 30-month period of observation in 83 of the patients, involving aorto-femoral, aorto-pulmonary, brachiocephalic, femoral-popliteal, and iliofemoral prostheses. The failures involved 8 cases in which femoral-popliteal prostheses were employed with a diameter of 6 mm rather than 8 mm; whereas excellent results were obtained with 8 mm diameter prostheses. Figures 1; references 2 (Russian).

UDC 617.57/.58-001.5-089.844-085.849.19

Bone Graft and Laser Treatment of Compound Fractures of the Extremities

907C0270B Minsk ZDRAVOOKHRANENIYE BELORUSSII in Russian No 8, Aug 89 (manuscript received 2 Dec 88) pp 41-44

[Article by S. I. Boltrukevich, A. S. Tretyakov, P. S. Reutov, L. N. Zenkov, A. V. Kalutin, B. A. Karev, K. N. Borisevich, Ya. N. Burneyko and Yu. A. Azarov, Chair of Traumatology, Orthopedics, and Military Field Surgery with Anesthesiology, Resuscitation, and Intensive Therapy Course; Occupational Pathology Course; Grodno Medical Institute]

[Abstract] An analytical survey was conducted on the results of various treatment modalities employed in the management of 203 cases with complicated limb fractures in-between 1980 and 1987. The male and female patients ranged in age from 16 to 76 years. The treatment modalities included alloplasty, demineralized bone matrix, alloplasty + compression-distraction apparatus, auto- + alloplasty, and incorporation of red and ultraviolet lasers. Laser treatment was carried out with LGI-21 (337 nm, 5 mW/2) or LG-75 (632.8 nm, 25 mW/c,^{2}) lasers; in one group, combined laser therapy was employed. Laser beams were directed at 3-4 points on the fracture for 4-5 min at each point, for a total of 15-20 treatment sessions. In the final analysis incorporation of laser treatment was observed to enhance osteogenesis and consolidation by 2-3 weeks in comparison with non-laser patients. The outcome was particularly favorable when used in conjunction with decalcified bone matrix. The use of decalcified bone matrix accelerated bone formation 1.2- to 2-fold in comparison with the time required with conventional allografts. References 14: 11 Russian, 3 Western.

UDC 582.28:620.198.82:620.193.8

The Effects of Various Techniques for Preservation of Aspergillus Niger V. Tighem on Its Aggressive Properties

907C0119 Moscow BIOLOGICHESKIYE NAUKI in Russian No 6, Jun 89 (manuscript received 30 Nov 87) pp 80-83

[Article by M. G. Simonyan, R. A. Petrosyan, I. A. Reshetnikova and M. V. Gorlenko, Chair of Mycology and Algology, Moscow State University imeni M. V. Lomonosov]

[Abstract] An analysis was conducted on the metabolic behavior and retention of capacity for biodegradation of polyamide materials after long-term storage of Aspergillus niger F-33 under various conditions. Storage involved maintenance of A. niger on polyamide materials for 2.5 years, cryopreservation for 1.5 years, in the lyophilized state for 15 years, and in soil for 13.5 years. Subsequent testing of polyamide target materials by differential thermal and thermogravimetric methods showed that the highest degree of biodegradation was exhibited by A. niger preserved on polyamide or in soil, followed by fungi preserved in the lyophilized state at 85°C, with the specimen then subjected to cryopreservation in liquid nitrogen. References 15 (Russian).

UDC 579.083.185.083.33

Method of Accelerated Solid-Phase Enzyme Immunoassay

907C0093 Moscow LABORATORNOYE DELO in Russian No 7, Jul 89 (Manuscript received 14 Jul 88) pp 75-76

[Article by A. T. Yakovlev, L. F. Zykin, I. V. Zimenkov, Volgograd Scientific Research Antiplague Institute]

[Abstract] The solid-phase EIAs developed in recent years are more and more useful in laboratory diagnosis of bacterial infections, including plague, glanders, melioidosis, brucellosis, tularemia, and anthrax. The purpose of this study is to develop optimal conditions for the set-up of EIA for rapid laboratory diagnosis of plague, cholera vibrions of non-01 group and brucellosis, to perform a comparative analysis of the conditions with those normally used, and to determine future prospects for its introduction. The researchers were able to detect the pathogens mentioned within three hours in concentrations of 1 x 10^3 to 1 x 10^4 microbe cells per ml. References 4 (Russian).

UDC 579.841.11

Study of Active Strains Destroying Alkylsubstituted Benzenes

907C0087B Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA BIOLOGICHESKAYA in Russian No 3, May-Jun 89 pp 37-40

[Article by R. M. Aliyeva, S. A. Rustemov, A. K. Alzhanova, Institute of Microbiology and Virology, Kazakh Academy of Sciences]

[Abstract] Previous studies noted that the selective suppression of high levels of toxicants present in the waste water from production of synthetic rubber stabilized the most adapted microfluora of active sludge, primarily bacteria of the genus *Pseudomonas*. The purpose of the work reported in this article was to isolate active strains destroying α-methylstyrene (AMS) and other alkylsubstituted benzenes, as well as to determine the taxonomic position of the strains isolated. Twelve *Pseudomonas aeruginosa* strains and four *P. putida* strains were isolated and studied. Aromatic compounds such as α-methylstyrene, styrene, toluene, and biphenyl were assimilated well by the microorganisms. None of the cultures grew well on *m*-xylene or on monocyclic aromatic acids. The DS16 and DS25 *P. aeruginosa* and DS21 *P. putida* did not assimilate *n*-oxybenzoic acid. None of the strains utilized naphthalene, pyrocatechol, phenol, cresol isomers, or chlorinated phenols. Overall, the microorganisms metabolized reduced aromatic compounds most actively and assimilated oxidized aromatic compounds poorly. Such differences are due to the different mechanisms of regulation of the primary stages of oxidation of aromatic hydrocarbons. The active growth of the strains on reduced aromatic compounds is related to induction of enzyme systems for direct hydroxylation of the aromatic ring. The action of extreme factors such as the level of toxicants, mercury ions and high temperatures leads to natural selection of a population with high destructive activity for alkylsubstituted benzenes. References 5: 2 Russian, 3 Western.

UDC 582.288.620.196

Species Composition and Population of Yeast and Yeastlike Fungi on Polymer Material Surfaces

907C0087A Vilnius TRUDY AKADEMII NAUK LITOVSKOY SSR: SERIYA V—BIOLOGICHESKIYA NAUKI in Russian No 1, Jan-Mar 89 (Manuscript received 2 Apr 87) pp 12-17

[Article by D. A. Laurinavichene, A. Yu. Lugauskas, T. F. Yokantayte, L. M. Grigaytite, Institute of Botany, Lithuanian Academy of Sciences]

[Abstract] A study is made of the species composition and population of yeast and yeastlike fungi on the surfaces of polymer materials exposed to the weather on the Baltic Sea coast in an open area, under a shed and in

an unheated warehouse. Also studied were morphological and physiological characteristics and taxonomic classification. A total of 189 yeast and yeastlike fungus strains were isolated; they involved nine genera and 18 species. The population of yeast and yeastlike fungi on the surface of most of the materials studied after exposure in the unheated warehouse was greater than that of the specimens exposed in an open area or in a shed. Most of the yeast and yeastlike fungus cultures grew easily at low (12°C) and moderate (12-30°C) temperatures, indicating the possibility of their participation in biodestruction of polymers in temperate climate zones. References 6: 4 Russian; 2 Western.

UDC 616.98:579.842.23:579.252.5].08

Integration With the Chromosome: An Alternative State of Calcium-Dependent Plasmids in Yersinia Agents

907C0037A Moscow MOLEKULYARNAYA GENETIKA, MIKROBIOLOGIYA I VIRUSOLOGIYA in Russian No 5, May 89 (manuscript received 2 Jun 88) pp 7-11

[Article by A. L. Gintsburg, G. A. Shovadaeva, F. N. Shubin, N. V. Yanishevskii, G. Naterman, F. Khorsh, S. P. Protsenko, M. S. Pokrovskaya, Scientific Research Institute of Epidemiology and Microbiology imeni N. F. Gamaleya, USSR Academy of Medical Sciences, Moscow; Scientific Research Institute of Epidemiology and Microbiology, Siberian Department, USSR Academy of Medical Sciences, Vladivostok; Humboldt University, Berlin; Scientific Research Antiplague Institute of the Caucasus and Trancaucasus, Stavropol]

[Abstract] The purpose of this study was to explain the presence of pCad plasmids integrated into chromosomes in naturally occurring, epidemically dangerous strains that cause Y. pseudotuberculosis and Y. enterocolitica. In order to manifest the properties determining pathogenicity, Yersinia should be able to express a number of genetic determinants of pathogenicity, many of which are closely-related or genetically identical plasmids. Three pathogenic representatives of Yersinia that have this plasmid are capable of expressing many factors of pathogenicity: calcium-dependence of growth at 37°C, auto-agglutination ability, synthesis of V and W antigens, etc. Strains containing the pCad plasmid are virulent. Chromosome DNA was analyzed by blot-hybridization to test whether the pCad plasmids were integrated into chromosomes, and it was shown that the pCad plasmids have all the expression necessary for the infection. Figures 2, references 17: 5 Russian, 12 Western.

UDC 579.881.11:579.222:577.112].083.3

Electrophoretic and Immunochemical Characterization of Proteins From Strains of Rickettsia prowazekii With Varying Virulence

907C0037B Moscow MOLEKULYARNAYA GENETIKA, MIKROBIOLOGIYA I VIRUSOLOGIYA in Russian No 5, May 89 (manuscript received 14 Jun 88) pp 20-26

[Article by M. Ye. Yeremeeva, Ye. B. Lapina, N. M. Balayeva, V. F. Ignatovich, L. S. Belousova, B. A. Dmitriev, Scientific Research Institute of Epidemiology and Microbiology imeni N. F. Gamaleya, USSR Academy of Medical Sciences, Moscow]

[Abstract] Only one R. prowazekii strain (E) has been isolated that leads to the development of a milder form of epidemic typhus and is not capable of multiplying in human macrophages and murine macrophagelike cells in vitro. It is a spontaneous mutation of the virulent Madrid E strain, buts its attenuation is unstable, and in certain conditions, a reversal of its virulence properties occurs. Comparative electrophoretic and serologic research of the total protein content of E and EVir and the standard virulent Breinl strain was conducted to determine differences in the structural components of R. prowazekii cells of the isogenic E strain vaccine and its highly virulent revertant EVir. Comparison of the electrophoretic analysis of E, EVir, and Breinl strains showed their protein distribution to be virtually identical at major and minor polypeptides, with the exception of the major protein with an M_r of 30 kD. This is the first experimental proof that the Rickettsia strains differ on a molecular level, and that the difference in the immune response to the cells is not due to a difference in proteins, but is due to their topology in the Rickettsia cell. Attenuation of the E strain is tied to dominant expression of the antigenic determinant, which is not significant to the virulent strain, but reflects the development of two forms of the infection caused by the isogenic pair. The most superficial structures, and thus, the first stages of interaction of the causative agent with the target cell, are not the same as the infection caused by R. prowazekii strains of varying virulence. Restriction of E-strain reproduction and accumulation of the highly virulent Breinl strain occur in the cytoplasm of the host cell. Figures 5, references 29: 3 Russian, 26 Western.

UDC 577.21:579.25.5

Expression of the Exogenous Human Insulin Gene in Subcultures and Clones of Fibroblasts Being Cultivated

907C0035b Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR: SERIYA B—GEOLOGICHESKIYE, KHIMICHESKIYE I BIOLOGICHESKIYE NAUKI in Russian No 8, Aug 89 (manuscript received 20 Jan 89) pp 71-74

[Article by L. L. Lukash, L. N. Neborachko, S. V. Podolskaya, I. S. Varzanova, T. G. Titok, T. I. Buzhiyevskaya, V. A. Kordyum, Institute of Molecular Biology and Genetics, UkSSR Academy of Sciences, Kiev]

[Abstract] The possibility of selecting cells transformed by the DNA of a plasmid that carries the insulin gene, without the use of a helper gene that provides toxic-substance resistance, was elucidated. Human and murine fibroblasts into which a recombinant plasmid containing the human insulin genome gene is introduced with a promotor in the absence of a helper gene are known to secrete a specific protein product into the culture medium. In passivation of the cell subcultures that contain the exogenous human insulin gene, the researchers noted an increase in the level of proinsulin (insulin) being secreted, to 140-260 ng/ml medium from 40-60. The cells from the clones that were produced also secrete into the culture medium a protein-product of the insulin gene which has a specific functional activity that lowers the glucose concentration in the culture. The cells from the subcultures being studied are capable of dividing in a culture without the serum that contains TPA, and they clone more effectively. When cells of human plasmid DNA that contain the human insulin gene are transfected for subsequent cloning and selection of cell populations that express the information introduced, a helper gene and selection in the presence of a toxic agent are not necessary. Figures 1, references 6 (Western).

UDC 57.047:613.167

The Microwave Coherent Field of the Body and the Nature of Chinese Meridians

907C0035d Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR: SERIYA B—GEOLOGICHESKIYE, KHIMICHESKIYE, I BIOLOGICHESKIYE NAUKI in Russian No 8, Aug 89 (manuscript received 9 Jan 89) pp 77-81

[Article by S. P. Sitko and V. V. Gizhko, VNK [not further expanded] "Otklik, " Kiev]

[Abstract] The cells of the body may produce a resonance radiation that underlies and maintains functional coherence in the body. Ye. A. Andreyev and colleagues have discussed the possibility in terms of a reaction-diffusion system for forming dissipative structures. Some researchers have suggested the possible existence in biological systems of substantially non-linear collective perturbations whose energy spectrum exhibits states with an energy difference on the order of a microwave quantum. On the basis of those ideas, the researchers here assumed the possible existence of cellular bioresonance and examined a one-dimensional model system consisting of a linearly absorbing medium and an easily saturated, amplifying subsystem of cellular bioresonance. They hypothesize that classical acupuncture points are exit points to the surface of the body of limiting cycles, each of which is an electromagnetic plane wave that has a limited section and runs along a structurally stable trajectory (classical meridian). These limiting cycles appear as a result of the generation of resonance radiation in the system of "saturated active cell centers and a linearly absorbing medium." Changes of the functional state of cells in one field of the body may affect the trajectory of the limiting cycle, its amplitude and frequency, causing changes in the functional state of cells in other parts of the body. Figures 15: 10 Russian, 5 Western.

UDC 615.384:547.221].015.4.07(048.8)

Induction of Microsomal Monooxygenase by Completely Fluorinated Orgranic Compounds (Survey)

907C0031b Moscow VOPROSY MEDITSINSKOY KHIMII in Russian Vol 35 No 3, May-Jun 89 pp 9-18

[Article by V. V. Obraztsov, A. Yu. Grishanova, V. M. Mishin, Institute of Biological Physics, USSR Academy of Sciences, Pushchino; Institute of Clinical and Experimental Medicine, Siberian Department, USSR Academy of Medical Sciences, Novosibirsk]

[Abstract] Experimental data gleaned from domestic and foreign literature on the induction of microsomal monooxygenase by systems of completely fluorinated organic compounds and information on their individual physical and chemical properties are summarized. Possible consequences of using blood substitutes based on fluorocarbons are discussed. Prospects for using fluorocarbon inductors of cytochrome P-450 in experimental and clinical medicine are examined in terms of the prevention of jaundice, Cushing's disease, non-insulin dependent diabetes, etc. References 68: 15 Russian, 53 Western.

UDC 615.214.015.4:612.821].07

Feasibility of Using Techniques of the Pattern Recognition Theory in Psychopharmacology

907C0031a Moscow FARMAKOLOGIYA I TOKSIKOLOGIYA in Russian Vol 52 No 3, May-Jun 89 pp 13-18

[Article by A. I. Machula, N. K. Barkov, Yu. I. Morozov, All-Union Science Center of Biomedical Problems in Study of Drug Abuse]

[Abstract] Research of the effects of psychopharmacological substances on the functional manifestations of central nervous system activity was conducted on widely varying levels. Problems of various psychopharmacological research techniques are discussed. A relationship between the integral picture of the body's behavior and the conditions of its internal subsystems that form structural and functional unity is needed, and the most effective solution of this problem may be use of the pattern recognition theory, which studies the interactions of processes occurring in complexly organized conditions. An important feature of this method is that it forms the structure of process interactions and relationship of the conditions of these objects based on studying statistical selections of indices. Actual programs for formalizing the integral condition of the body have been developed The effect of cathinone, a hallucinogen which causes sequential problem-solving to become less ordered, was analyzed using techniques of the pattern recognition theory. Using techniques of the pattern recognition theory permitted hidden information about the system upon which the drug was acting to be obtained. Figures 2, references 12: 8 Russian, 4 Western.

UDC 612.014.46:615.2

Morphologic Sequelae Reaction to Synthetic Polymer Administration

907c0076B Tashkent MEDITSINSKIY ZHURNAL UZBEKISTANA in Russian No 4, Apr 89 (manuscript received 24 Jun 87) pp 67-71

[Article by Ye. K. Shishova and D.Kh. Rakhmanova, Central Asian Medical Pediatric Institute; Tashkent Institute of Vaccines and Sera, USSR Ministry of Biomedical Industry]

[Abstract] The importance of polymers in medical technology led to an assessment of the biological sequelae of parenteral administration of synthetic polymers. The experimental approach consisted of histopathologic evaluation of the internal organs of guinea pigs and mice to determine the effects of M-1 (40:60 vinylpyrrolidone-:acrylic acid) and M-2 (50:50) in doses of 50 mg/kg given once or twice (5 days apart). Examinations of the heart, lungs, spleen, kidneys and liver demonstrated dystrophic changes in conjunction with enhanced vascular permeability and foci of hyalinization. The pathology of each organ reflected the structural characteristics of the organ, but repeated administration of M-2 was generally more damaging. This difference in the effects of M-1 and M-2 was attributed to the low level of metabolic detoxication and to M-2 and its physicochemical properties. Figures 3; references 5 (Russian).

UDC 615.212:547.822.3]012.1.07

Synthesis and Analgesic Activity of 4-Anilide-1-Substituted-2,5-Dimethylpiperidines

907C0041a Moscow KHIMIKO-FARMATSEVTICHESKIY ZHURNAL in Russian Vol 23 No 5, May 89 pp 562-565

[Article by R. S. Vartanyan, V. V. Martirosyan, S. A. Vartanyan, E. V. Vlasenko, L. K. Durgaryan, A. S. Azlivyan: Synthesis and Analgesic Activity of 4-Anilide-1-Substituted-2,5-Dimethylpiperidines]

[Abstract] 4-aniline piperidines are the most powerful analgesics presently used in medicine. 1-alkyl-2,5-dimethyl-4-piperidines were used to synthesize 4-aniline piperidines, analogs of the analgesic Phentanyl. Biological tests of the compounds being studied showed that a number of these derivatives have a morphine-like analgesic effect. It was established that chemical compounds that have COC2H5 and COC4H3O at the nitrogen atom in the amide group are the best analgesics, and 1- (2-phenethyl)-2,5-dimethyl-4-N-propionylaniline piperidine is far superior in activity and breadth of pharmacological action.

UDC 615.281.547.898].015.4.07

Antimicrobial Effect of Aliphatic and Aromatic Crown Ethers

907C0041c Moscow
KHIMIKO-FARMATSEVTICHESKIY ZHURNAL in Russian Vol 23 No 5, May 89 pp 578-583

[Article by L. A. Konup, I. P. Konup, V. E. Sklyar, K. N. Kosenko, V. P. Gorodnyuk, G. V. Fedorova, E. I. Nazarov, S. A. Kotlyar: Antimicrobial Effect of Aliphatic and Aromatic Crown Ethers]

[Abstract] Pharmacological research of macrocyclic polyesters showed that they are very physiologically effective. Aliphatic and aromatic crown ethers (including dibenzo-18-crown-6 derivatives) that have alkyl, aralkyl, acyl, nitro- and aminogroups, and halogen atoms were synthesized for studying antimicrobial activity. Twenty-seven crown ethers were tested for antimicrobial activity using typical microorganisms. The antimicrobial effect depends substantially on the chemical structure. Aliphatic and non-substituted aromatic crown ethers and halogen derivatives of dibenzo-18-crown-6 do not inhibit the test cultures. Alkyl-replaced crown ethers had the most antimicrobial activity, while that of aralkyl-replaced crown ethers was reduced. The effects of antimicrobial crown ethers were studied using lipid bilayer membranes. Ionophoric crown ethers were most effective in suppressing microorganism growth, but using ionophoric antibiotics in medicine is restricted due to their high toxicity. Alkylating aromatic crown ethers (dibenzo-18-crown-6) yields products that are antimicrobial and 10 times more toxic.

UDC 615.212.7:547.822.3].012.1.07

Stereochemistry and Biological Properties of Phenaridine, a New Narcotic Analgesic

907C0041b Moscow
KHIMIKO-FARMATSEVTICHESKIY ZHURNAL in Russian Vol 23 No 5, May 89 pp 573-578

[Article by R. S. Vartanyan, V. O. Martirosyan, S. A. Vartanyan, A. P. Engoyan, E. V. Vlasenko, L. K. Durgaryan, A. S. Azlivyan, A. V. Val'dman: Stereochemistry and Biological Properties of Phenaridine, a New Narcotic Analgesic]

[Abstract] Synthesis of new derivatives of 1-alkyl(aralkyl)-2,5- dimethylpiperidine was previously described, from which a new morphine mimic, 1-(2-phenylethyl)-2,5-dimethyl-4-N-propionylaniline piperidine, Phenaridine, was selected. Its stereochemistry and results of biological tests are presented. It consists of a mixture of three isomers. Comparison of the duration of the analgesic effect of the three isomers showed that isomer III lasts longest, 1.5 and 1.3 times longer than the other two. Phenaridine is more effective than morphine and promedole, and lasts longer than phentanyl. It is more effective when administered intravenously, and less toxic when subcutaneously injected, and causes no direct or cross tolerances.

UDC 615.015.11:519.86

Descriptor-Topological Model for Analyzing Structure-Activity Relationships

907C0041d Moscow
KHIMIKO-FARMATSEVTICHESKIY ZHURNAL in Russian Vol 23 No 5, May 89 pp 605-607

[Article by V. E. Kuz'min, N. V. Vityuk, V. V. Pozigun: Descriptor- Topological Model for Analyzing Structure-Activity Relationships]

[Abstract] Techniques which only use information from structural formulas of molecules being researched for evaluating and classifying physiologically active substances are being used to solve QSAR problems. They can be divided into 2 groups. The first group concerns methods where certain functional groups or fragments - descriptor centers - are isolated from the structural formula of the molecule. One of the problems with this model is the lack of information about the surroundings of descriptor centers and their respective arrangement. The second group uses integral characteristic structural-topological indices and invariants of molecular graphs for analyzing structure- activity relationships. With this method, information about the atoms composing the molecule is lost, and it is impossible to isolate the functional groups responsible for a given property. Structure-activity relationships, a combination of the two previously described methods, were analyzed. Descriptor centers were selected and their topological surroundings and relative position considered. The parameters obtained may be used in pattern recognition techniques as well as correlation and regression models for solving QSAR problems. Algorithms have been developed in two languages for computer use.

UDC 615.33.038

Eremomycin - A New Antibiotic Among Polycyclic Glycopeptides

907C0040b Moscow ANTIBIOTIKI I KHIMIOTERAPIYA in Russian Vol 34 No 5, May 89 pp 348-352

[Article by G. F. Gauze, M. G. Brazhnikova, N. N. Lomakina, L. E. Gol'dberg, A. V. Layko, G. B. Fedorova, T. F. Berdnikova: Eremomycin - A New Antibiotic among Polycyclic Glycopeptides]

[Abstract] The antibacterial antibiotic eremomycin was produced while searching for new antibiotics and is included in the same group as glycopeptide antibiotics in which carbohydrates are bonded with a linear heptapeptide which has triphenoxytriaminotricarboxylic and diphenyldiaminodicarboxylic acids. The polycyclic glycopeptide antibiotics are of great interest to medicine,

since they act well on meticillin-resistant strains of staphylococcus. It is especially noteworthy that microorganisms resistant to it have not appeared. Three of the members of this group - Vancomycin, ristomycin, and teycomycin - are used for treating serious diseases caused by agents resistant to other preparations. Eremomycin is most similar to Vancomycin and differs only in the structure of the tri-nucleic amino acid and carbohydrate composition. It acts on gram-positive bacteria, and operates similar to Vancomycin and ristomycin, but is 2-10 times stronger. It is relatively non-toxic, less toxic that Vancomycin and ristomycin, does not cause local irritation, unlike Vancomycin and ristomycin, and may be intravenously and intramuscularly injected. It is eliminated from the organism primarily in the urine. It is currently being clinically tested.

UDC 591.543+612.53+612.58+612.822

Hypothermic Effects of 1-10 kD Fraction of Small Intestine of Hibernating Suslik Citellus Undulatus in Mice under Hypoxic and Hypercapnic Conditions

907C0127 Leningrad ZHURNAL EVOLYUTSIONNOY BIOKHIMII I FIZIOLOGII in Russian Vol 25 No 3, May-Jun 89 (manuscript received 24 Dec 87) pp 318-323

[Article by D. A. Ignatyev, S. G. Kolayeva, L.I. Kramarova and I. I. Kravchenko, Institute of Biological Physics, USSR Academy of Sciences, Pushchino, Moscow Oblast]

[Abstract] Studies on the hypothermic effects of the 1-10 kD fraction isolated from the small intestine of hibernating susliks, Citellus undulatus, in mice were conducted at 16°C to assess the degree of prolongation obtained at low temperatures under hypoxic and hypercapnic conditions. After intraperitoneal injection with 0.05 and 0.1 weight equivalents of the 1-10 kD fraction per gram in 18-22 g outbred mice, the mice were placed in a 770 cm^2 chamber at 16°C and monitored for rectal temperature. Depending on the dose, body temperature fell from 38 to 18.7°C and remained depressed with gradual recovery after removal from the chamber for some 24-36 h. Under ambient temperature conditions hypothermia persisted for only 2-3 h. Pretreatment of the animals with 60 μg/g 5-hydroxytryptamine gave similar but less stable prolongation than that achieved by lowering the temperature to 16°C. Injection of 30 μg/g 5-hydroxytryptamine was ineffective, indicating fine control of the hibernation "trigger." Figures 1; references 15: 7 Russian, 8 Western.

'Ural' Barochamber for Hypoxia Therapy Developed

907c0072 Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 13 Oct 89 p 4

[Article by I. Baranovskiy, Orenburg-Moscow: "Ascent to Health"]

[Abstract] A barochamber, Ural-1, has been developed by F. Meyerson of the Institute of General Pathology and Pathophysiologic Physiology for therapeutic use. The chamber's effect is based on the systemic invigorating effect that hypoxia has been shown to exert. The chamber was manufactured by the scientific production association Kriogenmash and is being used at the medical unit attached to the production association Orenburggasprom. It can accomodate 30 persons and attain rarefaction equivalent to an altitude of 3.5 km at a rate of 10 m/sec in what is a comfortable cabin that, on the outside, is reminiscent of Captain Nemo's submarine. To date, some 1,000 patients have been treated by this form of hypoxia therapy for a wide spectrum of conditions. Both patients and healthy subjects have benefitted from 30-35 daily sessions. In general, a weight loss of 2 kg has been observed after a course of treatment, work efficiency improved by 30%, and half of smokers have given up tobacco. Beneficial effects have been observed in cases of hypertension, schizophrenia, mental depression, and diabetes, to name a few examples. While the exact mechanisms of action of hypoxia have yet to be defined, it has been shown that adaptation to hypoxia entails an increased level of synthesis of nucleic acids and proteins in the brain, heart, and liver of experimental animals; the higher levels of nucleic acids and proteins serve to increase the functional capacity of the organs that protect the body against oxygen deficiency. Lung volume increases, coronary and cerebral vessels grow, and the liver removes cholesterol from the body at an accelerated rate. Additionally, and opioid peptides accumulate in endocrine glands. The combination of these factors appears to check or reverse various pathologic states.

UDC 612.822.1

Effect of Neurohormone C on the Release and Uptake of [^{3}H]-Noradrenaline in Synaptosomes of the Hypothalamic Region of the Rat Brain

907C0038C Yerevan NEYROKHIMIYA in Russian Vol 8 No 1, Jan-Mar 89 (manuscript received 9 Jul 87) pp 106-110

[Article by L. N. Arakelyan, A. R. Armenyan, R. M. Srapionyan, R. O. Karapetyan, F. M. Saakyan, S. A. Saakyan, A. A. Galoyan, Institute of Biochemistry, Armenian Academy of Sciences, Yerevan]

[Abstract] Researchers in the hormone department of the Institute of Biochemistry have identified four peptide neurohornomes (K, C, G, and hexapeptide) which are formed in the neurosecretory granules of cells of magnocellular nuclei of the hypothalamus and help regulate cardiac activity. Neurohormone C is a water-soluble, low-molecular compound with high coronary dilation ability. The effect of neurohormone C on the uptake and release of [^{3}H]-noradrenaline in hypothalamic synaptosomes was studied. The effects of various concentrations of neurohormone C on K^+-stimulated release of [^{3}H]-noradrenaline in hypothalamic synaptosomes were discussed, and it is noteworthy that while 1.5 and 56 mU/ml concentrations did not alter K^+-stimulated release of [^{3}H]-noradrenaline from the synaptosomes, the other concentrations (3, 7, 14, 28 mU/ml) of neurohormone C tested did suppress [^{3}H]-noradrenaline release. Neurohormone C does not affect the specific uptake of [^{3}H]-noradrenaline by hypothalamus synaptosomes. It has been concluded that neurohormone K stimulates, and neurohormone G, depending on the concentration, either suppresses or stimulates K^+-stimulated release of [^{3}H]-noradrenaline, while hexapeptide suppresses this process. Neurohormone C plays a role in presynaptic regulation affecting the release of noradrenaline in the hypothalamus. Figures 1, references 14: 10 Russian, 4 Western.

UDC 577.11:616.45-001.1/3

Effects of the Delta-Sleep Peptide on the Metabolism of Biogenic Amines in Experimental Neuropathy Induced by the Administration of L-Dopa and Penicillin

907C0038A Yerevan NEYROKHIMIYA in Russian Vol 8 No 1, Jan-Mar 89 (manuscript received 15 Ju' 88) pp 87-94

[Article by Ye. L. Dovedova, Scientific Research Institute of the Brain, All-Union Scientific Center of Psychiatric Health, USSR Academy of Medical Sciences, Moscow]

[Abstract] The effects of the delta-sleep peptide on the brain during development of neurologic and psychopathologic disturbances were studied. L-Dopa, which causes some psychomotor stimulation, and penicillin G, which causes experimental epilepsy, were used to simulate these conditions in animals. The neuromediating systems were assessed by the types A and B MAO activity levels and the level of biogenic amines in the sensomotor cortex and caudate nucleus of the brain in normal conditions and under the influence of delta-sleep peptide before and after drug administration. The targets of research were subfractions of "light" and "heavy" synaptosomes and free mitochondria of neurons separated in a density gradient of 0.8-1.4 M saccharose. The effect of delta-sleep peptide was opposite that of L-Dopa on enzyme activity and was expressed by the normalization of MAO type A activity and the suppression of type B activity in the subfractions of the sensomotor cortex and the caudate nucleus in the absence of an effect on acetylcholine esterase activity.. Regulator peptides, especially the delta-sleep peptide, help maintain the monoamine balance in the brain, and thus play an important role in central nervous system adaptive processes. It is concluded that at least one of the elements of the delta-sleep peptide's anti-neurotic action involves activation of the serotoninergic system, which alters the function of other neuromediating systems and is reflected in the neuronal activity and behavior of the animals. Figures 3, references 21: 19 Russian, 2 Western.

UDC 547.953 + 547.964

Long-Lasting Decrease of Lipid Peroxidation in Rat Brain Following Administration of Neuropeptides

907C0038B Yerevan NEYROKHIMIYA in Russian Vol 8 No 1, Jan-Mar 89 (manuscript received 4 May 88) pp 95-100

[Article by N. V. Gulyaeva, L. S. Bikbulatova, A. B. Obidin, M. G. Ayrapetyants, R. I. Kruglikov, Institute of Higher Nervous Activity and Neurophysiology, USSR Academy of Sciences, Moscow]

[Abstract] The mechanisms of neuropeptide effects on the central nervous system are still unclear. The effects of neuropeptide administration on the intensity of free radical lipid oxidation and certain lipid indices of the rat brain were studied. ACTH and des-glycyl-arginine-vasopressin suppressed lipid peroxidation in the brain and blood of rats; the changes lasted much longer in the brain than in the blood. Neuropeptide administration causes a brief build-up of phospholipids in the brain. An increase in cholesterol is also noted, but its dynamics differ substantially depending on the neuropeptide injected. In the free radical mechanism of cellular metabolism regulation, as a result of the inhibition of lipid peroxidation, the lipids are enriched with more labile, easily oxidized fractions, and the cholesterol content in the tissues when the lipid peroxidation is suppressed. Figures 3, references 13: 8 Russian, 5 Western.

Reorganization of Public Health, Pharmaceutical System in Stavropolskiy Kray

907c0008 Moscow MEDITSINSKAYA GAZETA in Russian 12 May 89 p 2

[Article by A. Parfeynikov, candidate of pharmaceutical services, docent, Pyatigorsk Pharmaceutical Institute, Stavropolskiy Kray, under the rubric "Point of View": "Pharmacies: Are They Supposed to Trade, or Treat?"]

[Abstract] The resolute support of the USSR and the RSFSR Ministries of Health led to reorganization of the pharmaceutical services in Stavropolskiy Kray, leading to the merging of the Medtekhnika department and pharmacy administration in the Stavropolskiy Kray. This administrative measure resulted in a savings of 80 thousand rubles in operational costs, forced a more rational practice of drug prescription, and enhanced pharmacist-physician interaction and consultation. Further streamlining and unification of the various components of the pharmaceutical services—with due attention to cost effectiveness, drug supply, and service—should greatly advance the quality of health care in the Stavropolskiy Kray and consumer satisfaction.

UDC: 364.25:614.876(477)
Chernobyl]:681.326.33(47+57)

Elaboration of an All-Union Register of Individuals Exposed to Radiation as a Result of the Chernobyl Nuclear Power Plant Accident

907C0084 Moscow MEDITSINSKAYA RADIOLOGIYA in Russian Vol 34 No 7, Jul 89 (manuscript received 12 Jul 88) pp 3-6

[Article by A. F. Tsyb, A. N. Dedenkov, V. K. Ivanov, V. F. Stepanenko, V. V. Pozhidayev, V. A. Pitkevich, Ye. G. Matveyenko, Ye. A. Ispenkov, O. Ye. Stadnik, M. A. Maksyutov, Ye. A. Gagin, S. A. Ayrapetov, O. G. Polskiy, R. N. Turayev, A. Ye. Romanenko, B. A. Ledoshchuk, N. I. Omelyanets, A. S. Sytnik, V. N. Buryak, V. A. Stezhko, G. A. Losev and I. I. Linge, Scientific Research Institute of Medical Radiology, USSR Academy of Medical Sciences; All-Union Research Center for Radiation Medicine, USSR Academy of Medical Sciences; Institute of Biophysics, USSR Ministry of Health; USSR Ministry of Health, Ukrainian Ministry of Health and Belorussian Ministry of Health]

[Text] Immediately after the accident at the Chernobyl Nuclear Power Plant, the USSR Ministry of Health adopted a large-scale program for the development of an All-Union Distributed Register (ADR) in order to create long-term, automated, personal records of individuals exposed to radiation as a result of this accident. The records would also include their children and subsequent generations, radiation doses, and evaluation of health status and changes in that status. The ADR is a multilevel data and control system that covers virtually all parts of the nation and provides for automated support of the following:

- health screening of the public
- treatment and rehabilitation based on the results of the screening
- study of the structure, nature, dynamics and trends of morbidity and the outcomes of that morbidity for the group under observation
- special programs and scientific programs for studying medical sequelae of the accident at the Chernobyl Nuclear Power Plant.

The specific features associated with the creation of the ADR result not only from its large scale in terms of its territorial and numerical coverage (more than 600,000 people, 300,000 of whom are on the Union level of the register), the number of different specialists involved, and the absence of a prototype for the system being developed, but also from the fact that screening examinations and their data support had to be started as soon as possible in order to assess the medical sequelae of the accident and take the necessary measures. For that reason, the draft designs for the ADR were adjusted and improved as experience was gained in the functioning of its individual components and subsystems.

Material and Methods

Figure 1 illustrates the optimal hierarchic configuration of the ADR as a distributed system that includes rayon, oblast, republic and Union levels of observation. This ADR structure makes it possible to effect dynamic observation to a maximal extent for the relevant groups of people, to make efficient use of computer hardware (YeS and SM computers and PCs) and software with varying capacity, and to achieve coordination of data on examination results when they are transmitted via computer media.

Figure 2 illustrates the flow of data in the ADR. Before reaching the Union level, data on the screening of specific groups of people travel a complicated route: initial documents are filled out at central rayon hospitals and city hospitals, they are evaluated, the data are transferred to magnetic tape, the data are submitted to a logic machine check at the level of the republic computer and data-processing centers just before the files are transmitted to the Union level ADR in Obninsk, and a final logic machine check at the Union level. It should be noted that such a check system provides a completely satisfactory quality of documents received on the Union level ADR. It was possible to virtually exclude the possibility of reading-in erroneous documents, the volume of which does not exceed 0.5% at the present time, thanks to a system of double checking (a visual check by commissions of experts and a machine check at the level of computer and data-processing centers).

The ADR comprises three basic component support subsystems: medical-organizational, software, dosimetric.

Figure 3 illustrates the basic functions of the subsystems: (1) preparation of formalized medical documents and necessary instructions on filling them out; (2) checking magnetic tape, managing data bases, processing data by means of special computer programs; (3) calculation, reconstruction and recordkeeping of individual radiation exposure doses and the singling out of groups at risk.

Let us discuss briefly the content of those ADR subsystems.

The first subsystem, medical organizational support of ADR, comprises the Principle of the Register, which defines the objectives, tasks, structure and responsible organizations. The Principle of the Register specifies the procedure for movement of data on different levels, groups and contingents under observation, as well as the volume and frequency of treatment and rehabilitative measures. The most important aspect of the development and subsequent operation of the ADR is the development of medical documents intended for computer processing: registration cards filled out once; medical charts reflecting the results of the first and subsequent examinations; record of dosimetry data.

Medical-organizational support of the ADR also includes a number of instructions and recommendations on how to fill out properly the above-mentioned documents on the rayon level and how to transfer information to computer media. At the present time, a large

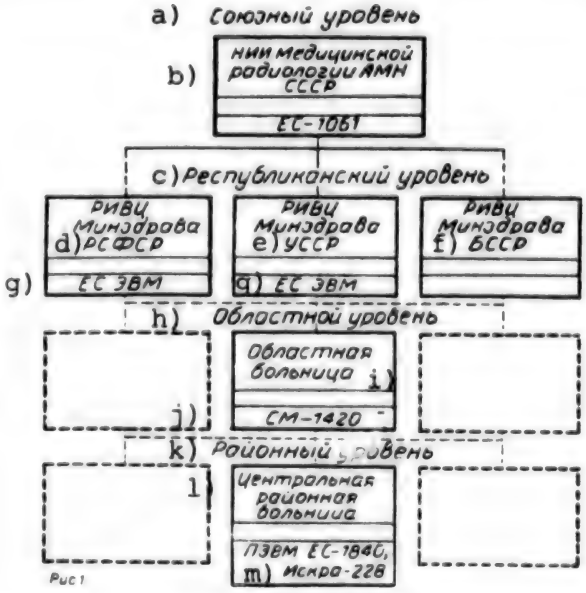

Figure 1. Structure of ADR

Key: a. Union level—b. Scientific Research Institute of Medical Radiology, USSR Academy of Medical Sciences—c. republic level—d. republic computer and data-processing center (RCDPC) of RSFSR Ministry of Health—e. RCDPC of Ukrainian Ministry of Health—f. RCDPC of Belorussian Ministry of Health—g. YeS computers—h. oblast level—i. oblast hospital—j. SM-1420 computer—k. rayon level—l. central rayon hospital—m. PC YeS-1840, Iskra-228 computers

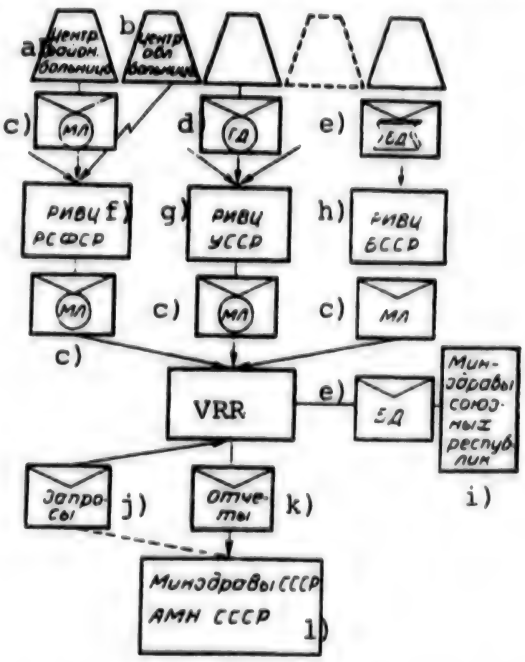

Figure 2. ADR Data Flow

Key: a. central rayon hospital—b. central oblast hospital—c. magnetic tape—d. floppy disk—e. print-out—f. RSFSR RCDPC—g. Ukrainian RCDPC—h. Belorussian RCDPC—i. ministries of health of union republics—j. queries—k. reports—l. USSR ministries of health, USSR Academy of Sciences

Figure 3. Basic Functions of ADR Subsystems

Key: a. support components—b. medical-organizational—c. software—d. dosimetry—e. formalized medical documents and instructions—f. checking of magnetic tape, management of data bases, data processing—g. calculation and reconstruction of individual radiation doses, singling out groups at risk

volume of work has been done on methodology and instruction locally, in order to assure proper preparation of all primary register documents.

The second subsystem—ADR software—consists of three units (Figure 4): a unit for checking and correcting initial documents, a system for data base management, and an analytical unit.

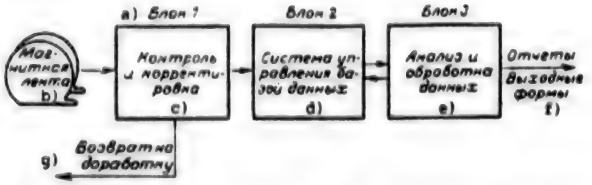

Figure 4. Software Subsystem (Explanation in the text)
Key: a. unit 1—b. magnetic tape—c. check and correction—d. data base management system—e. data analysis and processing—f. reports, output forms—g. returned for correction

Logic machine checking comprises two sets of software. One of them provides for checking and correcting all initial documents personally for each individual. The second provides for complete checking of the entire file of documents. As a result of the computer check, a error protocol is outputted in a convenient form, and a magnetic tape is formed with the incorrect documents so they can be revised.

The next unit—ADR data base—provides for storage and multiaspect access to the data. With the resources of the data base management system it is possible to speedily effect multiaspect output of relevant data.

The third unit—the analytical unit—is intended to produce output documents concerning the status and dynamics of the ADR, as well as to identify the patterns and trends in the state of health of the groups under observation.

The dosimetry support subsystem of the ADR (Figure 5) permits keeping automated records, calculating and inputting in the data base the individual absorbed doses of internal and external radiation built up in the thyroid and in the whole body. For this, use is made of information being inputted in the ADR as a result of the filling out of the above-mentioned initial documents. In addition to calculation and reconstruction of absorbed doses, the subsystem of dosimetry support effects logic checking of dosimetric data entering the ADR.

In order to reconstruct the personal radiation doses for subsequent years of operation of the ADR, suggestions have been elaborated at the present time to establish regional and central data-retrieval systems containing data about the radiation and hygienic features of monitored territories.

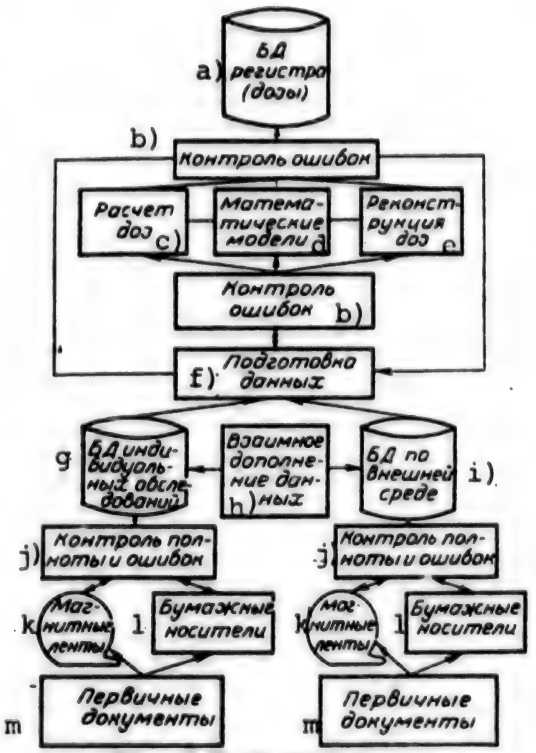

Figure 5. Dosimetry Subsystem
Key: a. Register data base (doses)—b. error check—c. calculation of doses—d. mathematical models—e. dose reconstruction—f. preparation of data—g. data base for individual examinations—h. reciprocal data supplementation—i. environmental data base—j. check for completeness and errors—k. magnetic tape—l. print-out—m. initial documents

The following basic factors were taken into consideration in the development and management of the ADR and in the implementation of the main goals and tasks of the automated data system:

- completeness of the inclusion in the ADR of the entire contingent subject to registration and observation
- stability of operation under conditions of migration and change in registered data
- use of dynamic observation data over the entire period of system operation
- integration and processing of data transmitted from various sources, and feasibility of expansion and correction of input and output flows
- feasibility of developing the system and adapting software for subsequent generations of computers and operating systems

The general diagram of functioning of the ADR operation illustrated in Figure 6 includes the needed resources for carrying out the proposed tasks.

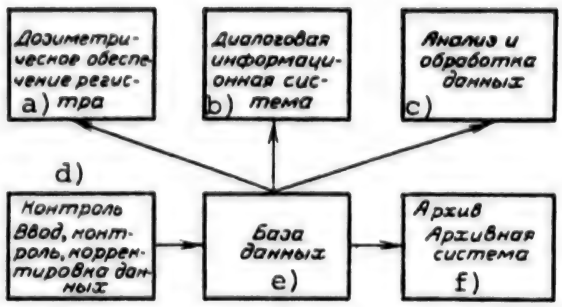

Figure 6. ADR Operating Chart

Key: a. register's dosimetry support—b. dialog data system—c. data analysis and processing—d. checking of input, monitoring and correction of data—e. data base—f. archive, archive system

Development and management of the ADR and the provision of long-term, automated, personal records of individuals exposed to radiation are difficult medical-organizational and scientific-technical tasks. The long life of the planned ADR (tens of years) and its scope and importance to the choice of strategy and tactics in the development of atomic energy, to the use of ionizing radiation in the national economy, and to the effective and integrated solution of problems of radiation safety make it imperative for all specialists and organizations involved in this project to work smoothly and with coordination.

Conclusions

1. An ADR has been developed and adopted in practical health care for the purpose of keeping records of radiation doses and for long-term evaluation of health status of individuals exposed to radiation as a result of the accident at the Chernobyl Nuclear Power Plant.

2. Medical-organizational software and dosimetry support of the ADR makes it possible to carry out multiaspect data processing for the purpose of automated monitoring of the course of health screening and implementation of the necessary treatment and rehabilitation measures.

3. The ADR provides efficient data support for systems analysis of medical sequelae of the accident at the Chernobyl Nuclear Power Plant, and it is the data base for implementation of special and scientific programs.

Status of Medical Cooperatives

907C0067 Vilnius SOVETSKAYA LITVA in Russian 7 Sep 89 p 3

[Interview with Georgiy Shvyrkov, senior research associate at the Institute of Economics and Forecasting of Scientific-Technical Progress of the USSR Academy of Sciences, under the rubric "Health Service": "Are Medical Cooperatives Needed?"; first paragraph is source introduction]

[Text] **A network of medical cooperatives, which are playing an increasingly important role in the organization of medical services for the public, has been widely developed in the country recently. Journalist Yuriy Sigov discusses the present state of medical cooperatives with Georgiy Shvyrkov, senior scientific associate at the Institute of Economics and Forecasting of Scientific-Technical Progress of the USSR Academy of Sciences.**

Correspondent: Who works in medical cooperatives? After all, the problem involving the outflow of skilled medical personnel into the cooperative sector has become especially acute recently.

Shvyrkov: Certified physicians now constitute 59 percent in medical cooperatives. About 6 percent of them are doctors of medical sciences and 24 percent, candidates of sciences. As is well known, according to law, one can participate in cooperative activity in one's free time from work, or one can choose a cooperative as one's principal place of work. Only 10 percent of the physicians prefer the cooperative as the principal place of work. Among mid-level medical workers, the percentage of those working in cooperatives only is twice as large. Of course, this attests to the outflow of medical personnel into cooperatives.

Correspondent: What is the reason for the desire on the part of physicians to leave state service and to change over to work in cooperatives?

Shvyrkov: There are two main reasons—material incentives and the desire to more fully realize their professional capabilities. At the same time, the search for stable income sources also forces cooperatives to seek out new service forms. Medical cooperatives have begun to conclude contracts with enterprises for offering them treatment and health-promoting services. Now 41 percent of all the cooperatives in the USSR are engaged in such activities.

Correspondent: What specialties are most widely used by the public?

Shvyrkov: Gynecologists, neuropathologists, stomatologists, and surgeons can be singled out as the most frequently visited physicians. At the same time, types of medical cooperative activity such as Eastern medicine are very popular with the population. These medical cooperatives are becoming widespread particularly in the Far East, Transbaykal, and regions of southern Siberia. Physicians skilled in acupuncture, as well as specialists in physical therapy (for the most part, they are Chinese, Mongolians, Koreans, and Buryats), have a broad clientele not only among the local population—people from all the corners of the Soviet Union come here for treatment.

Correspondent: Who, for the most part, are the patients of medical cooperatives?

Shvyrkov: Among them, workers make up 73.5 percent, pensioners, 10 percent, and students, 4.8 percent. Among the reasons impelling them to turn to cooperatives for medical help, the physicians' higher (in their opinion) skills occupy the first place (56.4 percent). Next is the lack of needed physicians in rayon polyclinics and the more caring attitude that medical personnel in cooperatives show toward their patients. At the same time, despite the increase in the number of medical cooperatives, the problem of lines also persists here.

Correspondent: Despite the attractive side of the new medical cooperatives springing up in our country, high cooperative prices frighten away many people.

Shvyrkov: According to the research conducted, about 13.6 percent of all the patients have spent as much as 5 rubles on a visit to medical cooperatives, about 30 percent, as much as 10 rubles, 27 percent, as much as 15 rubles, and 8.5 percent, as much as 20 rubles. I would like to add that, at the same time, 7.3 percent of the patients paid more than 60 rubles for their visit to medical cooperatives. You will agree that this a considerable amount of money. Therefore, many people, as before, believe that a visit to medical cooperatives is very taxing on their family budget.

Correspondent: Nevertheless, are patients satisfied with medical services in these cooperatives?

Shvyrkov: A survey we conducted showed that more than 48 percent of the people who had visited medical cooperatives were satisfied with the level of service, and only 4.6 percent of those questioned were dissatisfied, complaining about the poor quality of medical services. And another curious factor: more than 60 percent of the patients who fell ill for the second time decided to go again to medical cooperatives, and only 3.7 percent of the people turned down their services, saying that they did not trust cooperative workers and did not consider them qualified enough to provide good treatment.

On the whole, however, medical cooperatives continue to develop in the Soviet Union and, in the very near future, should increase the volume of services offered to the population even more. At the same time, it must be remembered that the establishment of medical cooperatives is by no means supposed to replace the state system of public health, but should only assist in the realization of the general state program for improving and preserving people's health.

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Problems and Solutions in Rural Health Care and Services

907C0106A Moscow ZDRAVOOKHRANENIYE ROSSIYSKOY FEDERATSII in Russian No 7 Jul 89 pp 3-10

[Unattributed article]

[Abstract] An All-Russian Conference on Rural Health Care and Services was held in Barnaul on April 4-5, 1989, to address the health status of the rural population of the RSFSR. The conference was opened by N. T. Trubilin, deputy chairman, RSFSR Council of Ministers, who reported that in 1988 the rural health indicators were unsatisfactory, in part because of the shortage of medical personnel and an inadequate network of health facilities. According to Trubilin, improvements in rural health will depend on successful implementation of economic incentives and fee-for-service arrangements between agricultural enterprises and health care providers. A. I. Potapov, minister of health of the RSFSR, provided statistical information on the unsatisfactory state of rural health, emphasizing that rural mortality is twice that of the urban population. Trauma and injuries are the major factors in the high rural mortality, often attended by alcoholism. In some regions only 10-20% of the population has access to tap water, and only 15% of the rural population has access to emergency medical services. Poor maternal and child health services account for an infant mortality that exeeds urban mortality by 10-15%. Finally, the organizational and administrative structure of the rural pharmaceutical services need revamping to alleviate the perennial shortage of drugs and other medicinal preparations. The conference concluded with adoption of resolutions and specific recommendations to raise the level of rural health care in the RSFSR.

Radioisotope Diagnostic Centers in Moscow

907c0062b Moscow VECHERNAYA MOSKVA in Russian 30 Aug 89 pp 1, 4

[Article by N. Kuznetsov and V. Kucherenko, under the rubric "The 'Zdorovye' Program": "Consultation and Diagnostic Centers: Problems and Prospects"]

[Abstract] The network of diagnostic centers in Moscow utilizing radionuclides has revolutionized many diagnostic approaches and has been instrumental in simplifying many diagnostic procedures and in offering the advantages of noninvasive technology. However, the shortage of equipment, supplies, and instruments remains a chronic problem, compounded by difficulties with maintenance. To a large extent, this is due to the fact that the Soviet radiological diagnostic industry is woefully underdeveloped, and state-of-the-art technology has to be imported from the West. In addition, serious complications are introduced by the present administative structure and by the lack of economic incentive at the individual centers to do better. Until these shortcoming are addressed in the spirit of perestroyka and glasnost, little improvement further improvement is to be expected.

Training Physicians for Work Under Emergency Conditions

907C0190A Alma-Ata ZDRAVOOKHRANENIYE KAZAKHSTANA in Russian No 6, Jun 89 pp 6-8

[Article by L. V. Kim, A. N. Volodina, L. A. Morozova, V. A. Valivayev and S. R. Sagatbekov, Department of

Medical Service Civil Defense, Alma-Ata Institute of Postgraduate Medicine, USSR Ministry of Health]

[Abstract] Earthquakes and floods constitute the most frequent natural disasters experienced in Central Asia and Kazakhstan. In the early moments of such disasters the brunt of responsibility for providing medical assistance to the population is borne by the emergency medical assistance teams. Unfortunately, the training of medical cadres for such responsibilities is quite inadequate. For this reason the Alma-Ata Institute of Postgraduate Medicine, in conjunction with the Kazakh SSR Ministry of Health, has developed a curriculum for specialization in emergency medical care. In 1984-1986, a total of 48 physicians participated in this program, most of them (83.4%) from Alma-Ata; the group consisted of two-thirds men and one-third women. Among the difficulties observed during this course was that the individuals assigned to perform emergency medical work were poorly trained, in general, for such work. Special preparation was required for emergency care and evacuations in mountainous regions, along with the treatment for special problems such as prolonged compression from being buried under dirt and rubble. Considerable experience was gained in the earthquake in Armenia, where Kazakhstan medical teams worked for a long time.

Pharmaceutical Supply Problems

907C0102B Moscow MEDITSINSKAYA GAZETA in Russian 23 Jul 89 p 2

[Article by Z. Guppe, pharmacist/information specialist at Khabarovsk pharmacy No. 27, under the rubric "A Reply": "Why Manufacture Drugs That Aren't Needed?"]

[Text] In Khabarovsk today there are virtually no enzyme preparations, cardiac glycoside preparations, uroantiseptics, thyroid gland hormone preparations, metabolics, iron-containing preparations, or even multivitamins. Ten to 30 packages of these drugs come for the 25,000 people a polyclinic serves. How can we talk about efficacious treatment?

At the same time, above-norm stocks of ineffective, obsolete drugs like nonachlozine, ganglionic blocks, and norsulfazol accumulate on pharmacy shelves.

It would pay to examine the question of switching certain drugs forms for other, more effective forms. For example, pharmacies don't have enough papaverin in ampules or suppositories, whereas tablets, which aren't in demand, pile up in huge quantities. The ointment Apilak is hard for pharmacies to sell, whereas there's a shortage of it in tablets and suppositories. There's a big shortage of the aerosol Proposol, while the ointment Propotseum just lies around. Gramicidin C tablets come once every six months in quantities of 5-10 packages, whereas the gramicidin paste goes virtually unused. We need to increase and expand the assortment of drugs available in aerosol form and suppositories.

Foreign Currency for Chernobyl Medical Needs

907C0102A Moscow MEDITSINSKAYA GAZETA in Russian 26 Jul 89 p 1

[Article by A. Kryzhanovskiy, Belorussian Telegraph Agency correspondent, under the rubric "A Sharp Signal": "When Silence Is Not Golden"]

[Text] A half million dollars are urgently needed in order to help the children living in the regions affected by the Chernobyl AES accident. Hard currency is essential for the purchase of imported diagnostic equipment such as ultrasound scanners. Without such equipment it will be impossible to make early diagnoses of thyroid gland diseases caused by exposure to radioactive iodine during the first days of the disaster. This has been reported in the Belorussian press. Account No. 950000005 at the Minsk branch of the Belorussian Republic Bank of the USSR Foreign Economy Bank has been designated to accept funds for this purpose.

A letter signed by the first secretary of the Belorussian Communist Party Central Committee, Ye. Ye. Sokolov, and the chairman of the republic's Council of Ministers, M. V. Kovalev, and requesting assistance for the republic in the form of medical equipment, particularly imported equipment, was sent on March 14 of this year to the chairman of the USSR Council of Ministers, N. I. Ryzhkov. USSR Minister of Health Ye. I. Chazov supported this request at the country's Gosplan. In early April, some 980,000 rubles in first-category hard currency were allocated for Belorussian medical needs. But this money has yet to be seen in the republic. The money remains in the hands of the national Ministry of Health.

So far there has been silence in Moscow. But there has been a response to our appeal for help from far away Melbourne. A call at the Belorussian telegraph agency was received from the general director of the Australian Rapo Export-Import Company, F. Rappoport, who offered assistance with conditions that were very beneficial: the needed medical equipment will be delivered at a discount of about $100,000.

Representatives of the republic Ministry of Health are once again setting out for Moscow to obtain hard currency. They appealed to the Soyuzmedtekhnika association three times, but each time, they say, they were turned away.

The proposal has been submitted. Time is flying by, but there is only the cool silence from the officials of the national ministry.

UDC 614.2(575.4)

Medical Care for Turkmen SSR Population in 1984-1986

907C0083 Ashkhabad ZDRAVOOKHRANENIYE TURKMENISTANA in Russian No 2, Feb 89 pp 34-39

[Article by M. K. Kurbanmamedov and O. I. Guydzheva, TuSSR Ministry of Health]

[Text] In accordance with the decisions of the 17th Congress of the CPSU and the 23rd Congress of the Communist Party of Turkmenistan, decrees of the CPSU Central Committee and USSR Council of Ministers on "Steps for Further Improvement of Public Health Care," and other directives on health care, work has been done to further develop the system of Soviet health care, to improve the organization of medical care for the public and to strengthen public health.

In this survey, the advances that have been made in health care in 1984-1986 are described only in their general features.

In 1986, there was further development and improvement of the network of health care institutions, their material base was strengthened, and their staffing was bolstered. Table 1 illustrates the rise in the main indicators of health care development in 1984-1986 in this republic for all agencies.

Table 1. Main Indicators of Development of Health Care in Turkmen SSR

Indicators	1984	1985	1986
Physicians in all specialties	9,928	10,591	11,382
Mid-level medical personnel	27,693	28,697	31,240
Hospitals	277	283	298
Hospital beds	33,080	34,375	36,956
Medical institutions rendering outpatient-polyclinic care	467	490	523
First-iad and emergency medical care stations	7	7	7

As of 1 January 1987, there were 10,249 physicians in all specialties (including stomatologists) and 27,582 mid-level medical workers in the system of the TuSSR Ministry of Health. In 1984-1986, the number of physicians in the system of the Ministry of Health increased by 1,290—mainly internists, obstetrician-gynecologists, pediatricians, drug-abuse specialists, and stomatologists. The number of mid-level medical personnel increased by 3,520.

In 1986, there were 33.9 physicians per 10,000 population and 92.4 mid-level medical workers per 10,000 population. The highest figure for physicians and mid-level medical personnel belongs to Ashkhabad (93.3/10,000 and 123.7/10,000, respectively). The lowest figure for physicians belongs to Tashauz Oblast (20.5/10,000), and the lowest figure for mid-level medical personnel belongs to Ashkhabad Oblast (64.5). The rise in the number of medical personnel in the republic as a whole, for different oblasts, and for Ashkhabad is indicated in Table 2.

Table 2. Medical Personnel per 10,000 Population

	Physicians			Mid-level medical personnel		
Territorial division	1984	1985	1986	1984	1985	1986
USSR	41.2	42.0	42.7	112.2	113.5	114.7
Turkmen SSR	31.1	32.4	33.9	86.8	87.8	92.4
City of Ashkhabad	89.9	92.3	93.3	120.2	119.8	123.7
Ashkhabad Oblast	20.0	20.5	22.4	58.0	54.6	64.5
Krasnovodsk Oblast	26.7	27.7	28.5	94.7	97.2	102.0
Mary Oblast	22.7	24.0	25.4	76.7	77.5	86.4
Tashauz Oblast	18.7	19.7	20.5	84.9	88.6	90.7
Chardzhou Oblast	30.3	31.9	33.9	97.8	99.5	102.1

Physician staffing in the system of the TuSSR Ministry of Health rose somewhat in 1986, as compared to the preceding year, whereas the figure for mid-level medical personnel dropped. The highest physician staffing levels and mid-level medical personnel staffing levels belong to Tashauz Oblast (99.5% and 99.6%, respectively). The lowest figures for physicians are belong to Krasnovodsk Oblast (94.7%), for mid-level medical personnel, to Ashkhabad (87.3%).

As of 1 January 1987, there were 504 institutions in the system of the TuSSR Ministry of Health that render outpatient medical care, including 203 polyclinics and hospitals (with outpatient clinics): 44 departments in the central rayon hospital and rayon hospitals, 39 in city hospitals and three in pediatric hospitals; 96 outpatient clinics at district hospitals, 39 free-standing city polyclinics and outpatient clinics, six free-standing pediatric polyclinics, 157 rural outpatient clinics, 64 dispensaries

of varying specialities, 26 free-standing medical health centers. The number of institutions that render outpatient-polyclinic care increased by 33 in 1986, mainly the result of the opening of 16 new rural outpatient clinics and six drug-abuse dispensaries. All of the outpatient medical clinics that were opened are located in converted facilities. The growth of the network of medical institutions that render outpatient-polyclinic medical care to the public in the republic as a whole, the different oblasts, and the city of Ashkhabad (within the system of the TuSSR Ministry of Health) in 1984-1985 is shown in Table 3.

Table 3. Network of Medical Institutions That Render Outpatient-Polyclinic Medical and Hospital Care

	Number of institutions rendering:					
	outpatient-polyclinic care			hospital care		
Territorial division	1984	1985	1986	1984	1985	1986
Turkmen SSR	448	471	504	268	274	289
City of Ashkhabad	28	31	33	16	18	18
Ashkhabad Oblast	78	84	88	43	45	46
Krasnovodsk Oblast	49	51	52	33	33	33
Mary Oblast	120	110	127	73	73	76
Tashauz Oblast	68	70	81	49	50	55
Chardzhou Oblast	105	116	123	54	55	61

In 1986, work continued on the subdivision of city treatment and pediatric districts. At the end of 1986, there were 504 staff slots for district internists and 660 for district pediatricians in the system of the TuSSR Ministry of Health, the increase constituting 15 slots for district internists and 14 for district pediatricians.

The number of people per staff position is 1,755 per treatment district and 825 per pediatric district. District service grew in the republic in 1984-1986. Thus, if the number of territorial treatment districts and number of staff slots for district internists was 492 in 1984, it was 512 in 1986; the number of pediatric institutions and staff slots for district pediatricians grew to 691 from 668.

District pediatrician staffing levels grew from 96.9% in 1985 to 98.0% in 1986. For the USSR as a whole, that figure was 98.3%. District internist staffing levels dropped from 99.8% in 1985 to 99.0% in 1986. For the USSR, that figure is 95.7%.

As a result of the subdivision of districts, there has been a gradual decline in the work load of district physicians. To date, the work load of district internists—and particularly shop-affiliated physicians—is lower than the nominal load for a physician's slot, constituting 5,500 visits (office visits at polyclinics and house calls) per year for district internists, and 8,500 for shop internists. The work load of district pediatricians is also lower than the nominal load for this position, constituting 5,100-5,900 visits per year.

In 1986, a total of 1,736,900 people underwent periodic preventive check-ups, which is 4.0% more than in 1985. Of this number, 459,000 were adults, 198,100 adolescents, and 1,079,800 children. In 1986, 89.2% of industrial workers, 91.1% sovkhoz and kolkhoz workers, 95.3% of workers in the food-handling and communal institutions, 93.5% of those employed at children's institutions and 92.7% of students at tekhnikums and higher educational institutions underwent physicals.

The figure for the coverage with periodic examinations of individuals subject to preventive check-ups is 87.7% for the Turkmen SSR as a whole, which is considerably lower than the All-Union figure (96.0%).

Dispensary observation of broad-ranging groups of the public is growing in this republic from year to year. In 1986, some 428,600 people were under dispensary observation for chronic diseases—that included 292,500 adults and adolescents and 136,100 children 14 or under. In 1986, the number of people on the dispensary rolls increased by 15.8% over 1985 and 33.2% over 1984. In relation to the total population, the number of patients of all ages under dispensary observation for chronic diseases is growing: the number of patients under dispensary observation increased from 115.8/1,000 in 1985 to 127.5 in 1986. But those figures are still low (half the average All-Union level).

As of 1 January 1987, there were 289 institutions in the system of the TuSSR Ministry of Health that rendered hospital care. The number of hospital facilities increased by 21 in 1984-1986 period, mainly because of the increase in rural district hospitals and drug-abuse dispensaries.

There has also been a change in the structure of hospital facilities: in Krasnovodsk, the 100-bed city children's hospital was reorganized into an oblast children's hospital, and a new 230-bed oblast children's hospital was opened in Tashauz.

The number of hospital beds in the system of the TuSSR Ministry of Health increased by 2,460 over the figure for 1985, to 35,630. The increase in beds was mainly a result

of the renovation of existing hospitals and kolkhoz infirmaries in rural areas. The bed fund increased from 105.2/10,000 population in 1985 to 109.9 in 1986. Table 4 illustrates the increase in the bed fund in the republic as a whole, the different oblasts, and Ashkhabad (for all departments) in 1984-1986.

Table 4. Hospital Beds in Turkmen SSR

	Number of hospital beds					
	1984		1985		1986	
Territorial division	absolute number	per 10,000 population	absolute number	per 10,000 population	absolute number	per 10,000 population
Turkmen SSR	33,080	103.7	34,375	105.2	36,956	109.9
City of Ashkhabad	5,720	158.7	5,975	162.1	6,165	156.6
Ashkhabad Oblast	3,875	83.2	4,050	85.5	4,315	88.3
Krasnovodsk Oblast	4,110	120.6	4,110	118.5	4,110	117.6
Mary Oblast	7,095	97.2	7,310	97.4	7,906	102.5
Tashauz Oblast	5,245	83.5	5,620	86.8	6,360	95.7
Chardzhou Oblast	7,035	105.8	7,310	107.3	8,070	115.5

A total of 684,100 patients were admitted to all hospital facilities in the system of the TuSSR Ministry of Health in 1986, which constitutes 20.3 per 100 population (20.7 per 100 urban and 20.0 per 100 rural residents).

As in previous years, extremely low levels of hospitalization were noted in Ashkhabad (16.3/100) and Tashauz (19.4) oblasts, which had the lowest number of beds. The average figure for the republic for bed use dropped from 317 days to 315 in 1986. The indicators of bed use worsened somewhat in Ashkhabad, Mary and Chardzhou oblasts. The highest figures for bed use were found in Ashkhabad and Tashauz oblasts (326 days).

The average number of bed-days continued to decline in 1986 (16.9 in 1984, 16.2 in 1985, 15.6 in 1986).

If we exclude data for beds used for high-incidence pathology (tuberculosis, psychiatric and drug-abuse cases), the figure for average hospital stay for chronic patients constituted 13.9 bed-days in 1984, 13.9 in 1985 and 12.9 in 1986.

The morbidity composition of hospitalized patients was virtually unchanged, as compared to previous years: the highest percentages in terms of morbidity and hospitalization among adults and adolescents involved diseases of digestive organs (17.8%) and respiratory organs (14.4%) and infectious diseases (13.7%); those among children were respiratory diseases (45.6%) and infectious and parasitic diseases (23.7%).

Hospital mortality among adults and adolescents dropped from 0.7% in 1984 to 0.6%. A high hospital mortality rate due to acute myocardial infarction was observed in Krasnovodsk oblast (30.5%), the average indicator for the entire republic being 22.6%.

Not counting abortions, a total of 73,597 operations were performed in 1986 in all the hospital facilities in the TSSR Ministry of Health system, 12,247 of which were emergency surgical cases involving acute abdominal pathology.

The figures for emergency surgery did not change appreciably in 1986: there was a bit of a rise in the percentage of those admitted more than 24 hours after the onset of illness in cases of perforated gastric ulcer (a rise to 19.8% from 10.9) and acute cholecystitis (to 61.7% from 59.9).

The figures for other acute abdominal pathology remained at the former level or declined slightly.

Delayed hospitalization of patients requiring emergency surgery was observed in some oblasts of this republic.

The average figure for the republic as a whole for patients admitted more than 24 hours after onset of intestinal obstruction is 38%; it is 53.3% for Ashkhabad Oblast and 43.5% for Mary Oblast.

In acute appendicitis cases, 23.2% of the patients were admitted more than 24 hours after onset in Mary Oblast; the figure was 25.5% in Ashkhabad, and the average for the republic was 21.1%.

In cases of perforated ulcers of the stomach and duodenum, patients were hospitalized more than 24 hours after onset of illness in 32.0% of the cases in Chardzhou Oblast and 31.6% in Mary Oblast; the republic average was 19.8%.

In 1986, a total of 726 obstetrician-gynecologists were working in the republic, 658 (90.6%) of whom were in facilities of the TuSSR Ministry of Health system. The physician-patient ratio for such specialists remained at the same level as the preceding year—2.2 per 10,000 population.

The number of beds for pregnant women and parturients rose by 532 within a year's time, reaching 4,322, of which 4,262 (98.6%) were in the system of the TuSSR

Ministry of Health. Availability of beds for these patients increased in 1986, as compared to 1985, from 11.6/10,000 to 12.8.

The mortality rate for pregnant women, parturients and puerperas dropped from 0.91 per 1,000 births in 1985 to 0.74 in 1986.

A decline was noted over the preceding year in labor complications observed in maternity institutions with regard to certain diseases (preeclampsia, eclampsia, anemia, renal disease, sepsis).

The number of abortions performed decreased from 40.9 per 1,000 women child-bearing age 1985 to 35.5 in 1986; the all-Union average is 2.5 times higher (96.6).

In 1986, the pediatric population of the republic was served by 1,765 pediatricians, 1,600 of whom (90.7%) were in the system of the TuSSR Ministry of Health. The physician-patient ratio for pediatricians in the republic increased in 1986 from 4.7/10,000 in 1985 to 5.7.

The number of pediatric beds in the republic increased by 1,101 over the number listed for 1984, to 8,839; 811 of 1,101 belong to the TuSSR Ministry of Health system, which has 8,524. Availability of all categories of pediatric hospital beds increased from 24.1 per 10,000 in 1985 to 26.3 in 1986.

In 1986, the figures improved somewhat for neonatal care and care of infants one year old or under in the republic. The number of infants one month or younger who were under observation in a pediatric polyclinic, as related to the total number of infants one year or under who were under observation, decreased from 93.0% in 1985 to 91.9% in 1986. The number of infants whose mothers received prenatal home nursing care increased from 92.7% in 1985 to 93.2% in 1986. The number of house calls made by physicians during the first three days after a woman was discharged from the maternity hospital decreased from 87.4% in 1985 to 83.0% in 1986; the number of house calls by nurses increased from 94.9% to 95.7% in 1986.

The number of infants one year or under who were under regular observation by a physician decreased from 88.3% in 1985 to 82.7% in 1986. The number of visits among that contingent to a physician decreased on the average from 7.3% in 1985 to 7.1% in 1986; visits to a physician's assistant increased to 0.7% from 0.6%. House calls made by physicians (for preventive purposes and for care) increased to 6.8% from 6.7%, and those made by mid-level medical personnel decreased from 12.6% to 12.3%.

Thus, this analysis of statistics on the performance of treatment-and-prevention institutions in the republic as a whole, in the various oblasts, and in Ashkhabad enables us to draw conclusions as to certain positive changes that have been made in terms of bolstering the network of treatment-and-prevention institutions and the bed fund and increasing the number of physicians and mid-level medical personnel; at the same time, the figures are still below the all-Union average. There are still substantial shortcomings in the performance of health care institutions and in the quality of medical services and epidemiological observation; infant and maternal mortality rates in the republic are high. The study of the trends identified in the status of health care identifies a number of problems whose solution by the professionals in the republic's health care agencies and institutions will improve the indicators for the performance of health care institutions and for public health.

Portable Device for Restoring Respiration

907C0153B Moscow MEDITSINSKAYA GAZETA in Russian 11 Oct 89 p 2

[Article by B. Gertsenov, TASS correspondent: "Who Will Put It On The Assembly Line?"]

[Text] The first-aid physicians who arrived at the accident site succeeded in quickly resuscitating the accident victim. Helping them in the matter was the Gornospasatel-11 unit, which is used for restoration of human respiration. This multi-purpose instrument that can be placed into a small suitcase has a number of potential uses. It regulates the volume and frequency of respiration, and if respiration stops, it helps the patient breathe by relieving the appropriate muscles and enables the victim to inhale pure oxygen or a metered air-oxygen mixture.

The specialists at the Donetsk scientific production association Respirator who designed the instrument have offered it to coal-industry mine-rescue workers.

An interdepartmental commission has recommended the new instrument for series production. The USSR Ministry of Health has approved the instrument for practical use. The Voroshilovgrad Experimental-Pilot Plant for Mine Rescue Apparatus and Equipment is preparing to produce the first series of instruments.

"But the enterprise's resources are rather limited," said Candidate of Medical Sciences E. Akhlamov, laboratory chief at the Respirator scientific production association. "At best, it may satisfy the needs of mine rescue workers. In the meantime, as experience has shown, the instrument can be used for first aid and emergency prehospital medical aid. That is why the production of the instruments must be put on the assembly line."

UDC 575:591

Medical and Genetic Study of Krasnodar Kray. Distribution of Hemoglobin Pathologies

907C0206C Moscow GENETIKA in Russian Vol 25 No 6, Jun 89 pp 1108-1110

[Article by V. I. Golubtsov, A. A. Revazov and A. Yu. Asanov; Kuban Medical Institute imeni Red Army,

Krasnodar; Institute of Medical Genetics, USSR Academy of Medical Sciences, Moscow]

[Abstract] A study of genetic frequency of beta-thalassemia and anomalous type D and E hemoglobins involved blood donors (854 persons) and Russian school children (192) from seven regions of Krasnodar Kray and two regions of Adyge Autonomous Oblast and Adyge school children (412) from three regions of the Oblast. This area formerly included classical foci of malaria. The relatively high frequency of hemoglobin pathologies found in Krasnodar Kray may become a serious problem for public health agencies since this group of hereditary anemias requires specialized hematological and medical-genetic assistance. The study revealed the necessity for mapping and detailed study of this focus of beta-thalassemia in the USSR, in addition to the two known foci (Central Asia and the Transcaucasus). References 6: 4 Russian; 2 Western.

UDC 615.471:681.31].03

Computers in Preventive Check-Ups

907C0268C Moscow SOVETSKAYA MEDITSINA in Russian No 8, Aug 89 (manuscript received 20 Dec 88) pp 45-47

[Article by Ye. F. Stranadko, L. A. Aleksandrova and M. M. Osmolovskiy, MNIOI [not further expanded] imeni P. A. Gertsen]

[Abstract] An analysis was conducted on the benefits to be derived from the use of computers in management and analysis of mass screening data. Evaluation of the results at the No 23 Polyclinic in the Timiryazevskiy Rayon of Moscow, based on data derived in the 1983-1987 period on 14,469 individuals, showed that the miss rate for chronic conditions was only 1.1%. This figure respresents a 3- to 4-fold improvement over the accuracy of connventional mass screening and reflects the greater efficiency with which risk factors are identified. Equally important is the fact that none of the oncologic risk cases were missed.

Deaths Attributed to Radioactive Paneling in Donetsk Oblast

907C0317 Kiev RADYANSKA UKRAYINA in Ukrainian 8 Dec 89 p 3

[Article by P. Kalmash, editor, Kramatorsk newspaper, and L. Kokhanets, Donetsk Oblast]

[Abstract] A number of deaths, including those of young children, in one apartment in a high-rise in Kramatorsk have been atributed to paneling contaminated with a radioactive source emitting 200 roentgens per hour. The source of ionizing radiation has been identified as a radionuclide used for industrial purposes that accidentally had been immured in the paneling 7 or 8 years ago during its manufacture. Efforts are under way to track down other paneling that had been produced at that time, and criminal investigation is under way to identify the guilty parties in this tragedy. In addition, a number of residents of the apartment building are undergoing medical monitoring by leading specialists in nuclear medicine in Kiev.

Infertility, Birth Defects Linked to Work in Poultry Farms

907c0062A Moscow TRUD in Russian 17 Aug 89 p 2

[Article by V. Morgunova, TRUD correspondent, Saratov Oblast, under the rubric "The Woman at Work and at Home": "In Hothouse Conditions: Why Do Hothouse and Poultry Workers Have a High Incidence of Births of Underdeveloped Babies?"]

[Abstract] The Saratov Scientific Research Institute of Rural Hygiene has determined that 30-60% of the women employees at the Vesna State Farm and at the Tatishchev poultry farm under the age of thirty suffer from a variety of gynecologic disorders. These findings were attributed to the poor microclimatic conditions at the hothouses and exposure to various chemical agents—conditions predisposing them to infertility and birth defects. This situation has developed because primary emphasis has usually been placed on the level of agricultural production, with the health aspects of the working conditions trivialized. At the Vesna farm, steps have been taken to minimize exposure to toxicants in the hothouses. The results have entailed some reduction in harvest levels, but the health status of the female workers in the hothouse has improved, and so has that of their children.

Association of Psychotherapists Formed

907C0112B Moscow SOVETSKAYA ROSSIYA in Russian 18 Oct 89 p 2

[Article by N. Temurova: "Association Formed"]

[Text] The time has past when a poor physician could allow himself to say to a patient: "You don't have a disease. The problem is caused by nerves." The role of the psychotherapist today has grown immeasurably. That is the reason for the idea of forming an association of specialists in this very essential field of specialization. A working group of initiating physicians has done all of the necessary preparatory work to hold a constituent congress to form an association of practicing psychotherapists. The Congress will be held October 21.

Here is what our correspondent was told by Moscow Chief Psychotherapist A. Slutskiy: The formation of this kind of association has become an urgent need. There have been an enormous number of unqualified individuals who have been applying psychiatric means of therapy to treat persons suffering from various illnesses. The lack of specific knowledge in this complex field of medicine during or after a therapeutic process could result in the most serious kind of unforeseen consequences.

Our association must be composed of psychotherapists, psychiatrists, and physicians in other fields of specialization who employ psychiatric therapeutic methods and psychology and who are working at psychological correction clinics. Genuine folk medicine healers may also work under the aegis of the association. Membership in the association would be a guarantee of a practitioner's qualifications.

Cooperation by Central Asian Republics To Improve Health Safeguards

907C0002B Moscow MEDITSINSKAYA GAZETA in Russian 28 May 89 p 2

[Article by A. Prokin, MEDITSINSKAYA GAZETA correspondent, Alma-Ata, under the rubric "Our Home—the USSR": "A Step Across the Aryk: How the Central Asian Republics Have Consolidated Forces To Improve the Health Safeguards of the People"]

[Abstract] The high child mortality figures in the Central Asian republics have finally led to a regional effort at improving maternal and child health care. The effort has come about largely at the initiative of K. A. Subanbayev, Minister of Health of the Kirghiz SSR, who has established contact with the ministries of health of Uzbekistan, Turkmenistan, Tajikistan, and Kazakhstan. Cooperation in the field of health has been made possible by perestroyka's emphasis on bypassing centralized control by Moscow and encouragement of local problem solving. As a result, close cooperation is now the rule in Central Asia in exchange for information and in precluding unnecessary duplication in research and health planning. The consolidation of the health efforts in the region has both economic benefits and, more important, has gone a long way toward creation of a more efficient and reliable health service system in the region.

Disposable Syringe Plant Constructed in Tashkent

907C0066B Moscow PRAVDA in Russian 1 Aug 89 2nd Edition p 6

[Article by V. Artemenko: "For Doctors and Us a New Biography Has Begun"; first sentence is source introduction]

[Text] **Construction of a plant for the production of disposable syringes is under way in Tashkent.**

Not that long ago, a small group of specialists of the Sredazgazprom Association has been working here. But a considerable portion of the production areas were, as they say, "idle." That is why the government of the republic in its decree transferred the vacant buildings and installations to the joint Soviet-Italian enterprise Sovplastital.

"We shall renovate the installations which have been vacated," A. Melkumov, general director of the enterprise, reported, "and we shall organize the production of disposable syringes. UzSSR Gosstroy specialists will put the buildings into proper shape. The government of the republic will allocate us the currency-exchange funds. The whole complement of production equipment will be supplied by the Italian firm Ivalda, with the assistance of the firm Montek. Specialists of these firms have already prepared the production part of the project. Our Uzgiprotyazhprom Institute has begun to issue the estimates for the project."

I shall add this to the report of the general director: today the joint Soviet-Italian enterprise is actively engaged in preparing for new production. A group of our specialists will be in Italy who will take an on-the-job training course at enterprises manufacturing such medical equipment. Sovplastital is planning to start up the first line for the production of disposable syringes as early as next year, with a volume of 60 million items per year. In the future, it will manufacture as many as 300 million syringes per year.

Disposable Syringe Production by Microplasma Welding

907C0066A Moscow EKONOMICHESKAYA GAZETA in Russian No 37, Sep 89 p 2

[Article by S. Pravdenko, Kiev: "That Same Disposable Syringe: Scientists of the Institute Imeni Ye. O. Paton of the UkSSR Academy of Sciences Have Undertaken Work of the Utmost Importance"]

[Text] Is it not possible on the basis of microplasma technology to produce disposable needles and also syringes for them?

B. Shnayder, winner of the USSR and UkSSR State Prizes, who is now in charge of the Kiev Progress Scientific-Technical Center of the UkSSR Academy of Sciences dates the birth of this idea as April of this year. And as early as June, B. Paton, president of the UkSSR Academy of Sciences and director of the Institute of Electric-Arc Welding, convened a conference.

It was resolved to "consider the information of B. Shnayder and to approve activities for organizing industrial production of needles with the use of microplasma welding of blanks."

How, then, is the task which had been set to be accomplished? The Paton workers have secured the material support of the ASKO association of production and commercial associations, enterprises, and organizations at the Ukrainian Department of the Soviet Peace Fund.

The task was set for the Institute of Metallophysics of the Ukrainian Academy of Sciences to develop before the end of this year a domestic grade of steel for disposable needles so that currency would not have to be spent in the future for purchasing imported metal, a ton of which costs on the order of 10,000 rubles in exchange. The foreign technology for sterilizing needles and syringes uses gamma radiation. Kiev scientists have decided to go another route. They are also precluding the carelessness

of medical personnel. The design of the syringe developed in Poltava and used as the basic form makes it absolutely impossible to reuse the syringe and the needle.

Academician B. Paton has planned accelerated deadlines: manufacture of the new products is to be on line before the end of 1990.

The task has an extremely high priority and is economically very profitable. Indeed, it concerns the manufacture of hundreds of millions of items a year and, in the future, more than a billion items a year.

But, indeed, there is also a difficulty. In the future, the Paton workers intend to manufacture their own molding-welding machines for producing disposable needles. But now, in order to meet the accelerated deadlines and quickly and effectively turn out the needed production, it is necessary to purchase two imported units. That will make it possible to buy some time and start up production in Baryshevka before the end of next year. Up to a million rubles of currency is necessary for this. There will be a return, but where are these funds to come from now? Both the ASKO association and the Paton workers are thinking about this now.

One would like to believe that the enterprises and organizations earning the currency will help the Peace Fund and ASKO. To invest it in the production that is opening up is not only a noble gesture, but also one that promises large profits. Proposals can be made to the Kiev Progress Scientific-Technical Center, telephone 227-47-77.

Adverse Health Effects Observed in Bryansk Oblast

907C0319A Moscow RABOCHAYA TRIBUNA in Russian 18 Jan 90 p 4

[Unattruibuted article: "Radiation in the Class Register"]

[Text] Zlynkovskiy Rayon, in Bryansk Oblast, found itself in a zone of strict monitoring following the Chernobyl accident: The density of the area's contamination is 15-40 curies per square kilometer.

The presence of people here, especially children, is not without its consequences. This is confirmed by surveys conducted last year with a Japanese ultrasound instrument. First- and second-degree enlargement of the thyroid was detected in 90 percent of adults (out of 272 observed). Knots were encountered in one out of every three of them. First- and second-degree enlargement of the thyroid occurred in 387 of 3,000 examined children.

Because of faster tiring, lessons last 40 minutes in the schools. The children complain frequently of headaches, nosebleeds, low blood pressure and overall physical weakness. Many of the children do not travel beyond the rayon throughout the entire year, not even during summer vacations.

A vitamin problem that had not existed previously arose. The surrounding woods, you see, were a real treasure house to the inhabitants: cranberries, whortleberries, strawberries, mushrooms. Gathering all of this is now a health hazard. The vitamin deficiency needs to be compensated for by an energetic importation of fruits and vegetables. But they are practically unavailable in the stores. Only cooperative enterprises sometimes sell mandarin oranges—at a cost of 5 rubles 20 kopecks per kilogram.

Besides the shortage of foodstuffs, there are difficulties in providing medical service personnel, apparatus and radiation monitoring.

The residents do not sense the proper concern on the part of deputies, in contrast to the situation in neighboring regions of the Ukraine and Belorussia, where many problems associated with surmounting the consequences of the Chernobyl accident are being vigorously solved by the efforts of the people's representatives. In Zlynkovskiy Rayon, on the other hand, resettlement of nine population centers in which the radiation background is constantly too high because of the intense contamination of the territory is not planned until 1992.

Fifth-grader Inna Sviridova [pictured in a photo] began visiting the medical station more frequently after vacationing in Zlynka. This day her blood pressure was found to be low, and nurse G. Dergacheva had to give Inna some medicine.

That's the start of the log for registering gamma-radiation background.

Self-Financed "Aerozol" Center

907c0018 Moscow MEDITSINSKAYA GAZETA in Russian 14 Jun 89 p 2

[Article by A. Lepekhin, MEDITSINSKAYA GAZETA correspondent, Leningrad: " 'Aerozol' Has Its Own Revenues"]

[Abstract] The "Aerozol" Center for the Prevention of Respiratory Diseases has been put on a sound financial basis through the initiative of its director, P. P. Gorbenko, and deputy director, V. M. Sysuyev. They have made an effort to encourage initiative and innovation in the design and construction of therapeutic inhalation equipment and chambers and, as a result of marketing skills, have received orders totaling some one million rubles this year. Recent plans for expansion have included the preparation of various aerosol reagents useful in inhalation therapy, with the intention of eventually marketing these agents. These efforts at self-financing have provided a sound financial basis for expansion of the therapeutic services offered at the center, which would not have been possible under the inflexible financial arrangements that had previously prevailed at medical institutions. The key to success at "Aerozol" lies in the fact that an effective symbiosis has been created which combines the talents of physicians,

engineers, and designers in creating products and services that are demand, as well as in skillful marketing of their products and services.

Medical Equipment Plant Under Construction in Syzran

907C0068B Moscow IZVESTIYA in Russian 28 Aug 89 Morning Edition p 1

[Article by S. Zhigalov, IZVESTIYA correspondent: "Plant for Hospitals and Polyclinics"]

[Text] **The first stone has been placed in the foundation of a plant for the production of medical equipment.**

A construction site extends over dozens of hectares in the outskirts of Syzran.

Blocks, laboratories, and administrative buildings of the future giant plant will rise here. The construction of such a large enterprise by the forces of the Finnish firm "Meri Vaari" and the Yugoslav firm "Rad" is due not to the traditional monster mania, but to the disastrous conditions of our hospitals and polyclinics, which do not have sufficient medical beds and operating tables...

USSR Minister of Health Ye. Chazov, who visited the construction site, called the plant construction a significant event for Soviet medicine. The plant will produce more than 200 types of medical equipment. The quantity—dozens, hundreds, and thousands.

What will such a big enterprise give to the city and the region? This question was discussed at a session of the Syzran City Soviet. Proposals to give up the plant were heard. Deputies—managers of local enterprises—expressed the not unfounded fears that good working conditions at the new plant and appropriate cultural and communal facilities would "entice" the best personnel away from them. Owing to the switching of city construction organizations over to the plant, the rates of housing construction would slow down. Other projects, which the city needed, would be frozen.

"However, such 'patriotism' did not find a responsive chord among most deputies," I. Milyukov, chairman of the Syzran City Executive Committee, said. "The very coexistence of such a plant alongside city enterprises will contribute to a useful competition in the creation of working conditions and benefits for workers at presently existing ones. Builders of other subdivisions of the RSFSR Ministry of Construction in Southern Regions will provide assistance in the plant's construction."

The plant will help the city in the solution of the very acute problem of water supply, as well as other problems, and will build a hospital institution for 250 beds and cottages in Syzranskiy Rayon adjacent to us. This enterprise is clean ecologically.

Abovyan Plant to Convert to Medical Equipment Production

907C0066C Yerevan KOMMUNIST in Russian 10 Sep 89 p 1

[An Armenpress release: "A Factory Is Changing Its Profile; A Joint Decision of the ArSSR Council of Ministers and the USSR Ministry of the Medical Industry"]

[Text] The ArSSR Council of Ministers and the USSR Ministry of the Medical Industry have issued a joint order-decree on the conversion of the Abovyan Pilot Commercial Plant for Biochemical Preparations to the Abovyan Medical Products Plant of the Armbiotekhnologiya Scientific Production Association.

The new works, which will be set up in 1990-1992, will create the manufacture of disposable medical products, systems for transfusion and drawing of blood, intravenous catheters and injection needles, and blood containers and dialysis units, as well as infusion solutions.

The order-decree charged the Main Administration of Planning and Capital Construction of the USSR Ministry of the Medical Industry with reworking the design-estimate documentation of the Abovyan Medical Products Plant before the end of this year, as well as allocating the necessary capital to the Armbiotekhnologiya Scientific Production Association to set up the capacities called for.

The plant is also allocated funds for participation in housing construction and capital for building a kindergarten and a guest house for 150 people.

With regard to the set up of the new enterprise, the appropriate instructions have been given to various administrations of the USSR Ministry of the Medical Industry and also to the ArSSR organizations and departments.

The ArSSR State Committee for Environmental Protection has been instructed to conduct an ecological study of the pilot commercial units of the Scientific Research Production Institute of Amino Acids of the Armbiotekhnologiya Scientific Production Association and, from the results, to reach a conclusion about the possibility of operation.

It has been decided to move the republic's tuberculosis sanitorium out of the industrial zone of Abovyan before 1995.

It has been established that planning and construction of a new hospital in the AzSSR are to be provided by funds of the USSR Ministry of the Medical Industry, and the vacated site of the present hospital will be transferred to the Abovyan Medical Products Plant of the Armbiotekhnologiya Scientific Production Association for the organization of the production of consumer goods.

The ArSSR Gosstroy and Gosagroprom, the AzSSR Ministry of Health, and the ArSSR Committee for Environmental Protection have been ordered to submit to the AzSSR Council of Ministers within two months proposals for selecting the site for the construction of the complex of the new AzSSR tuberculosis sanitorium.

Yu. Kaliyanin, deputy minister of the USSR Medical Industry Ministry, and G. Oganesyan, deputy chairman of the AzSSR Council of Minsters and chairman of the AzSSR Gosstroy, have been made responsible for overseeing the execution of the order-decree.

Local Control of Public Health in Nargorno-Karabakh

907c0009 Moscow MEDITSINSKAYA GAZETA in Russian 14 May 89 p 1

[Article by V. M. Mishin, secretary, All-Union Central Council of Trade Unions, member, Special Administration Committee in Nagorno-Karabakh, under the rubric "Urgent Interview": "Nagorno-Karabakh: There's a Lot of Work Ahead"]

[Abstract] Three months ago a Special Administration Committee was formed in Nagorno-Karabakh to take administrative charge of all social, economic, and political matters. The sphere of interest includes, of course, public health and medical care in general. One of the most important tasks of the health authorities is to defuse ethnic strife and unfounded accusations that prefential care is accorded one group or other. The ties that bind Nagorno-Karabakh to both Azerbaijan and Armenia are indissoluble, and the the health ministries of both republics are actively engaged in improving health services in the oblast. Years of mismanagement and misallocation of resources have resulted in an oversupply of allied health personnel and a shortage of physicians, as well as in poorly equipped hospitals and clinics. Progress in overcoming problems and advancing health care in Nagorno-Karabakh rests on strengthening existing close contacts with the health establishments of both republics and cooperation. Intolerance and narrow ethnic perspectives will only serve to impede progress.

Scientific Center for Parapsychology Created

907c0071 Vilnius SOVETSKAYA LITVA in Russian
26 Aug 89 p 4

[Article by M. Abramovich: "Removing the Veil of Mystery From the Supernatural..."]

[Abstract] A scientific center for parapsychology has been created in Lithuania in association with the USSR Science and Engineering Societies, under the name of "Committee on Energy-Information Exchange in Nature." The center is headed by V. Kaznacheyev, who explained that the time has come to elevate parapsychology to the level that it enjoys abroad. The center will conducted studies on biolocation, telekinesis, poltergeists, and other aspects of parapsychology. Hopefully, the status of this field will be considerably enhanced and it will find its proper niche in medical diagnostics and therapeutics, as it has in the USA and England. The difficulties that the field of parapsychology has encountered in gaining acceptance in the Soviet medical community stem from the fact that it depends primarily on individuals with special sensibilities, rather than exclusively on instrumental measurements. The politicization of science has also held it back. The development of the full potential of parapsychology will require unreserved support from the Lithuanian SSR Ministry of Health. Unfortunately, this was not the case in the recent past.

UDC 615.249.1.015.41-612.017.1].07

Certain Indices of Immune Status Characteristics in Medical Radiologists

907C0085A Moscow MEDITSINSKAYA RADIOLOGIYA in Russian Vol 34 No 7, Jul 89 (Manuscript received 26 Apr 88) pp 7-10

[Article by K. D. Gelashvili, V. A. Osmanova, N. S. Khazarbegishvili, K. A. Kashiya, Tbilisi Medical Institute]

[Abstract] The lack of data in the literature on the effects of chronic exposure to low-level penetrating radiation prompted the authors to study the influence of low doses of radiation on immune status. The study, which involved 59 medical radiologists as subjects, indicates some degree of immune deficiency in persons exposed to long-term ionizing radiation in low doses that are within the limits allowed by law. The deficiency is manifested primarily as a decrease in the number of T-lymphocytes. The two most important factors relating to the immune deficiency were age and duration of employment as a radiologist. References 12: 6 Russian, 6 Western.

UDC 539.108:613.648

Metrologic and Operational Characteristics of Thermoluminescent and Photographic Film Dosimeters for Centralized Individual Dosimetric Monitoring of Medical Personnel

907C0085B Moscow MEDITSINSKAYA RADIOLOGIYA in Russian Vol 34 No 7, Jul 89 (Manuscript received 29 Mar 88) pp 72-76

[Article by L. Z. Kalmykov, G. I. Gorelik, L. L. Stadnik, I. N. Romanova, L. N. Kovalevskaya, Kharkov Scientific Research Institute of Medical Radiology, Ukrainian Ministry of Health]

[Abstract] The domestic centralized individual dosimetric monitoring service uses individual photographic film dosimeters and thermoluminescent dosimeters, primarily with lithium fluoride detectors. This article presents a comparison of the different types of dosimeters in terms of usage characteristics and metrologic characteristics. With photographic film dosimeters, the time spent on operations such as dosimeter preparation, densitometry, and film marking is 20-25% that spent on similar operations with thermoluminescent dosimeters. The most suitable detectors in terms of the monitoring per se are the DTG-4 and TLD-400 LiF detectors (the DTG-4, however, is more durable). While thermoluminescent dosimeters record total exposure (occupational and background), film-type badges measure only exposure to occupational radiation. Figure 1; References 7: 4 Russian, 3 Western.

UDC 577.391.621.386.86

Radioprotective Effect of Ribamidyl Cytostatic and Possible Mechanisms of Its Action

907C0160D Moscow RADIOBIOLOGIYA in Russian Vol 29 No 3, May-Jun 89 (manuscript received 1 Jan 87) pp 363-366

[Article by P. G. Zherebchenko, V. V. Znamenskiy, Ye. V. Suroyegin and I. I. Grechka, Institute of Biophysics, USSR Ministry of Health, Moscow]

[Abstract] In an earlier work (Belovskaya et al., DOKL. AN SSSR, 1980, Vol 250, pp 1259-1261), it was shown that nalidixic acid, the inhibitor of replicative DNA synthesis, exhibits radioprotective activity. Based on the assumption that many cytostatic compounds (antitumor and antibacterial reagents) possess radioprotective and therapeutic activity, the researchers here examined the radiation-inhibiting activity of Ribamidyl, an agent used in oncology. At the same time, they studied the effect of Ribamidyl on the migration and proliferation of spleen CFUs and on cellularity and mitotic index of bone marrow. Experiments involving a wide range of doses of Ribamidyl (10-400 mg/kg) administered to 756 (CBA x C57B1)F_1 mice, 130 Norway rats, 35 outbread rats, and 114 hamsters, before and after irradiation, showed that Ribamidyl has not only a marked radioprotective effect, but also a therapeutic effect. The window of maximum efficiency for the radioprotection was between 24 and 2 hrs prior to irradiation. Ribamidyl depressed the mitotic activity of bone marrow cells and intensified colony formation in the spleen. Ribamidyl stimulated proliferation of CFUs without interfering with their migration. References 6: 4 Russian, 2 Western.

UDC 577.391.599.323.4

Dose Thresholds of Physical Impairment in Mice and Rats After Irradiation

907C0160E Moscow RADIOBIOLOGIYA in Russian Vol 29 No 3, May-Jun 89 (manuscript received 27 Jun 88) pp 379-383

[Article by V. N. Malakhovskiy and P. P. Mikhaylichenko, Military Medical Academy imeni S. M. Kirov, Leningrad]

[Abstract] The goal of this work was to investigate the dose-time patterns of the effects of high-dose ionizing radiation on physical efficiency in mice and rats: physical endurance (swimming test in which rats' tails were weighted) and motor coordination (treadmill test). The following three dose thresholds were correlated with changes in physical endurance and coordination: (a) a relatively minor (10-30%), unstable reduction in endurance and coordination, with fluctuations and a varying time minimum for the first six hours, followed by normalization, was observed at doses up to 35 Gy; (b) a gradual, reproducible diminution of physical endurance down to 50% of the starting level around 2 hrs after

irradiation was observed in the dose range of 70-100 Gy, followed by partial normalization (this indicates existence of compensatory and recovery capacity of the organism); and (c) at doses of 200 Gy, a sharp diminution of physical endurance was observed down to a total loss of endurance at 1-2 hrs after irradiation, without any indications of recovery. These observations paralleled clinical effects at similar doses. It was concluded that these changes are related to disruption of central regulation rather than to disruption of muscle energetics; at doses exceeding 70-100 Gy, direct injury of the brain is assumed to have occurred. Figures 2; references 9: 6 Russian, 3 Western.

UDC 577.391.611.438.615.37

Effect of Myelopeptides on Postradiation Recovery of Thymus

907C0160a Moscow RADIOBIOLOGIYA in Russian Vol 29 No 3, May-Jun 89 (manuscript received 7 Jun 88) pp 326-330

[Article by S. F. Kuznetsova, Institute of Immunology, USSR Ministry of Health, Moscow]

[Abstract] Bone marrow cells produce low-molecular-weight immunoregulatory peptides that are called myelopeptides (MP). A new immunocorrective preparation called myelopid was developed from MP and shown to be highly effective in a number of pathological states accompanying immunodeficiency. The goal of this work was to investigate the effect of MP on postradiation recovery of the thymus by estimating its cellularity, the in vivo proliferation of thymocytes and composition of thymocyte subpopulations, and to determine possible mechanisms of action of MP on restoration of the T-cell component of the immune system after irradiation. The experiments involved irradiation of mice, strain (CBA x $C57B_1$)F_1 and showed that a single intraperitoneal injection of MP at a 10^{-5} mg/mouse dose one day after irradiation with 6.5 Gy ^{137}Cs γ-radiation initiated a cascade of proliferative and differential processes facilitating the recovery of thymus. After 10 days, the process of initial reparation is completed and the number of thymocytes begins to drop. Secondary atrophy of the thymus may be prevented by shielding the bone marrow. Final recovery of the thymus occurs after 20 days as a result of the uptake of bone marrow T-lymphocyte precursors and their proliferation and differentiation. MP is the only known immunoregulator acting at all stages of postradiation recovery of the thymus. Figures 3; references 16: 6 Russian, 10 Western.

UDC 577.391.599.323.4

Phase Structure of Early Disturbance in Activity of Rats After Irradiation

907C0160H Moscow RADIOBIOLOGIYA in Russian Vol 29 No 3, May-Jun 89 (manuscript received 28 Jun 89) pp 389-394

[Article by V. N. Malakhovskiy, M. I. Bokk, A. Ye. Yegorov and O. A. Stemparzhetskiy, Military Medical Academy imeni S. M. Kirov, Leningrad]

[Abstract] A syndrome of cerebral disturbances called early transient competence (ETI) was first detected some 30 years ago in monkeys exposed to short-term irradiation in doses of 20-80 Gy. Identification of the sequence of developmental stages in ETI, however, has been hindered by the fact that the irradiation conditions in the various experiments that have been performed over the years vary to such an extent that the data produced cannot be easily compared. The same is true of the criteria used for evaluating the functional state of the CNS. In the work reported here, the sequence of changes in competence indices and in CNS state during the early periods after irradiation was studied in rats. It was shown that reduced competence, particularly ETI, observed after irradiation is a complex of heterogeneous responses, including a number of phase states replacing each other or partially superimposed on each other. ETI includes the phases of excitation, hypokinesia, and neurologic disorders. There is a phase of irreversible reduction of the information capacity of CNS and tolerance to early transient incompetence as a result of repeated exposures. Curtailment of ETI does not mean a complete recovery of CNS functions, but a transition to a phase of early transient diminution of competence, during which the ability to solve discrimination problems under pressure of time was disrupted more severely and for a longer period than was transient diminution of learned actions of equivalent complexity. Figures 3; references 18: 10 Russian, 8 Western.

UDC 577.391.599.323.4

Multifactor Investigation of Relative Postradiation Changes in Various Categories of Behavioral Responses in Rats

907C0160E Moscow RADIOBIOLOGIYA in Russian Vol 29 No 3, May-Jun 89 (manuscript received 8 Sep 88) pp 367-374

[Article by B. I. Davydov, V. S. Tikhonchuk, V. N. Karpov and I. B. Ushakov]

[Abstract] The goal of this work was to investigate modification of behavioral responses in various categories of learning as affected by two factors: a qualitative factor (the degree of fixation of conditioned reflexes) and a quantitative one (radiation dose). Based on a new method of free-operant self-reinforcement feeding of rats, which were deprived of food for 6 days prior to the experiment, it was shown that γ-irradiation in doses ranging from 0.258 to 1.29 C/kg, diminished the probability of the animal making the first decision in a behavioral task, with a dose-response relationship. On the other hand, the average time required to make the first decision was not affected in the range of the doses studied. Irradiation of the head played the dominant role in the changes observed. Both the size of dose of γ-irradiation and the degree of fixation of conditioned reflex had an effect on fulfillment of a task by the animals. Taken independently, the effect of each of these factors was approximately identical when the other factor was varied, so that their interaction had an insignificant effect on the changes of the learned behavioral reactions. Figures 3; references 24: 20 Russian, 4 Western.

UDC 577.391.612.119

Use of Calf Spleen Extract to Stimulate Postradiation Recovery of Hemopoiesis in Irradiated Animals

907C0160I Moscow RADIOBIOLOGIYA in Russian Vol 29 No 3, May-Jun 89 (manuscript received 28 Jun 88) pp 403-406

[Article by O. I. Olontseva, B. B. Moroz, Yu. B. Deshevoy, G. V. Kalistratov, Ye. N. Shcherbova and V. I. Limorenko, Institute of Biophysics, USSR Ministry of Health, Moscow]

[Abstract] The effect of calf spleen extract on postradiation recovery of hemopoiesis in irradiated mice and hamsters was studied, as were the therapeutic properties of this extract when it is purified of excess proteins via high-performance liquid chromatography. An 8.5 Gy dose of radiation was found to cause the bone marrow form of radiation disease in the hamsters. Injection of purified cytoplasmic supernatant from calf splenocytes facilitated recovery of hemopoiesis and increased the survival of experimental animals. This purified spleen extract stimulated blood formation, affecting both the myeloid and erythroid processes, evoking a complex of nonspecific protection responses such as the liberation of endogenous growth stimulants and the elevation of the radioresistance of the animals. The enzyme activity of the purified spleen extract suggests that the inhibitors of DNAase I and Ca^{2+}, Mg^{2+}-endonucleases are involved in the postradiation transformations in the experimental animals. References 11: 8 Russian, 3 Western.

Radioecology of Farm Animals

907C0089B Moscow DOKLADY VSESOYUZNOY ORDENA LENINA I ORDENA TRUDOVOGO KRASNOGO ZNAMENI AKADEMII SELSKOKHOZYAYSTVENNYKH NAUK IMENI V. I. LENINA in Russian No 7, Jul 89 pp 46-47

[Article by A. D. Belov]

[Abstract] The article is a review of a book by N. A. Korneyev and A. N. Sirotkin, "Osnovy radioekologii selskokhozyaystvennykh zhivotnykh" [Basics of Radioecology of Farm Animals], which presents new scientific information on the migration of radionuclides from the soil through plants into agricultural animals and animal food products. Considerable attention is given to animal metabolism, the biological action of radiation, ways to reduce the entry of radioactive elements into food products, and urgent problems associated with pasture management and animal husbandry in agricultural areas contaminated with radioactive substances. The book includes experimental data produced by the authors themselves and materials gleaned from the domestic and foreign literature of the past 20-25 years. The practical significance of the book is greatly increased by the efforts to neutralize the effects of the accident at Chernobyl. Shortcomings of the book include insufficient materials on the biological effects of ionizing radiation on agricultural animals, the absence of information on the use of low doses of ionizing radiation to increase the productivity.

UDC 577.391.58.039.1.591.81

Effect of Polyamines on Radiation Response of Cells

907C0160B Moscow RADIOBIOLOGIYA in Russian Vol 29 No 3, May-Jun 89 (manuscript received 19 Sep 88) pp 338-342

[Article by H. Dalhelm, V. Ya. Gotlib [names as published], K. Mateyko and I. I. Pelevina, Central Institute of Isotope and Radiation Studies, GDR Academy of Sciences, Leipzig; Institute of Chemical Physics, USSR Academy of Sciences, Moscow]

[Abstract] The goal of this study was to determine how addition of exogenous polyamines (putrescine, spermidine, spermine) to rapidly proliferating cells affects their radiation response. The authors studied the action exerted by these compounds on plant and animal cells (A. cepa meristem and HeLa cells) and the possibilities of modifying the response of those two populations to radiation. The cytotoxic effect of the polyamines on HeLa cells was found to depend on polyamine concentration: at 10^{-2} M, spermine and spermidine killed most of the cells; at 5×10^{-5} M, they killed 80% and 60% of the cells, respectively. The least toxic was putrescine: with a 5×10^{-5} to 5×10^{-6} M concentration, no cells were killed. Therefore, in the radiation studies, putrescine was used, in a concentration resulting in a less than 20% kill rate. It did provide a radioprotective effect when administered prior to or after exposure to 6 Gy γ-radiation from a ^{60}CO source. With respect to the plant cells, the cytotoxic effect of putrescine and spermidine was negligible. Spermine administered in a concentration of 10^{-3} M showed only a tendency to increase the number of mitoses and protected the cells from radiation damage at 10 Gy. It was concluded that because of the reduced content of polyamines resulting from irradiation—an effect that leads to additional formation of chromosomal aberrations—exogenous polyamines can be used before and after radiation to achieve a protective effect. References 14 (Western).

UDC 57.083.3

Diagnosis of Plants Infected with Potiviruses By Means of Virus-Specific Cytoplasmic Inclusion Antibodies

907C0089A Moscow DOKLADY VSESOYUZNOY ORDENA LENINA I ORDENA TRUDOVOGO KRASNOGO ZNAMENI AKADEMII SELSKOKHOZYAYSTVENNYKH NAUK IMENI V. I. LENINA in Russian No 7, Jul 89 (Manuscript received 7 Mar 89) pp 15-19

[Article by N. A. Timoshenko, N. M. Aleksandrova, T. N. Konareva, N. V. Arshava, S. K. Zavriyev, All-Union Scientific Research Institute of Agricultural Biotechnology]

[Abstract] Potiviruses are the broadest group of plant viruses that infect such crops as potatoes, corn, legumes, sugar cane and fruit trees. One characteristic feature of these viruses is the accumulation in infected tissue of conical or cytoplasmic inclusions that are formed from a single virus-specific protein that has a molecular mass 67-70 kD and whose function has yet to be determined. Analysis of the amino acid sequence of the proteins of the cytoplasmic inclusions of tobacco etch virus indicates that the antigen properties of the cytoplasmic inclusions of some potiviruses may be rather similar. In turn, analysis of data pertaining to antigen properties of nonstructural proteins of such viruses points to the possibility of diagnosis of potiviruses with immunochemical techniques. The work reported in the article develops a method of immunodiagnosis of potiviruses in infected tissues based on the use of the cytoplasmic inclusion proteins as the diagnostic antigen. The experimentation involved inoculation of the leaves of Nicotiana tabacum L Samsun NN, Nicotiana glutinosa, and Nicotiana glevelandii with one of four potiviruses whose cytoplasmic inclusions were used to produce antibodies to potato virus A, potato virus Y, tobacco etch virus, and onion yellow dwarf virus. The researchers ultimately demonstrate the possibility of qualitative determination of a number of potiviruses in the extracts of infected plants by the immunochemical reaction with antibodies to the cytoplasmic inclusions of one of the viruses. The use of virus-specific proteins of cytoplasmic inclusions as diagnostic antigens was shown to have advantages over traditional EIA of phytoviruses that is based on antibodies against viral particles—the cytoplasmic inclusion proteins may be extracted from plant tissue in greater quantities, and the methods for isolating and purifying such proteins are simpler and more accessible. Figures 5; References 10: 2 Russian, 8 Western.

UDC 616.84-089.843-092.9:061.3(47+57)"1988"

All-Union Symposium 'Transplantation of Mammalian Brain Tissue'

907C0086B Moscow ZHURNAL VOPROSY NEYROKHIRURGII IMENI N. N. BURDENKO in Russian No 3, May-Jun 89 pp 61-62

[Article by N. A. Arkhipova, S. M. Blinkov, A. V. Golanov, V. A. Shabalov, Moscow]

[Abstract] The symposium, held in May of 1988 in Pushchino-na-Oke, was organized by the Science Center of Biological Research of the USSR Academy of Sciences, the USSR Academy of Sciences Council on Human and Animal Physiology, the Intermozg Problem Commission, and the institutes of biological physics and general genetics. Reports were presented at the symposium on the transplantation of mammalian brain tissue done in Moscow, Leningrad, Kiev, Minsk, Kharkov, the GDR, Poland, Czechoslovakia, England, and Cuba. Animal experiments involving physiology, morphology, and biochemistry were discussed, as were clinical aspects of the field. Animal experiments have shown that successful development of donor tissue requires that it be taken in a certain stage of embryogenesis, which depends on the species and tissue location. The most favorable conditions for development of the transplanted tissue are are reported to be those created by intraventricular insertion. Some researchers asserted that closer integration of the transplantate with the host brain is achieved with morphologic or functional match-up of transplantate tissue and area of transplantation. Functioning of synaptic connections of neurotransplantates with the host brain has been demonstrated by recording spontaneous and evoked neural activity. Human brain transplantation studies have been much more modest. Researchers reported that 7- to 9-week-old human embryo brain tissue is suitable for transplantation, with a significant potential for growth and cell differentiation. Successful results have been achieved in transplantation of the anterior hypothalamus and neurohypophysis into the inguinal region in certain diabetics. Experimental and clinical studies indicate the possibility of restoration of or compensation for lost CNS functions by replenishing neuromediators and neurohormones.

Soviet-US Cooperation in Magnetic Resonance Medical Applications

907C0070B Moscow ARGUMENTY I FAKTY in Russian No 40, 7-13 Oct 89 p 5

[Article: "Atom Against Cancer?"]

[Text] We have already told our readers about the initiative of two American businessmen—W. Bilson and G. Willens—aimed at promoting perestroyka processes in the USSR, in particular, conversion (AiF, Nos 44 and 51, 1988; Nos 4, 11, and 15, 1989). During his regular trip to the USSR W. Bilson met with Yu. I. Tychkov, deputy minister of nuclear power generation and industry, and A. A. Shishkin, general director of the Tekhsnabeksport Association operating under this ministry. This meeting was organized with the assistance of the Gradiyent Scientific Production Cooperative, whose representatives took part in it.

The proposals by V. I. Slesarev and I. V. Kuryashkin, associates at the Gradiyent Cooperative, evoked lively interest on the part of the president of the American medical corporation. The essence of these proposals lies in the establishment of a cost-accounting magnetic resonance center for diagnosis and therapy, which will function in close cooperation with specialists in the field of nuclear physics from research institutes of defense ministries. An early detection of oncological diseases by means of the modern method of nonionizing radiation diagnosis will be the center's basic task. Furthermore, systems of combined cancer therapy by methods of hyperthermia (heating tumors with high-frequency magnetic radiation) and magnetic resonance with the use of contrast facilities, whose prototypes are already undergoing biological tests, will be developed at the base of this institution.

The center's tasks will also include the training of radiological specialists and the establishment of a ramified network of affiliates in the country. The Voroshilovgrad Oblast Executive Committee and the oblast party committee (first secretary I. A. Lyakhov) supported the establishment of the first of such affiliates in Voroshilovgrad.

One of the American firms developing a similar scientific direction expressed the wish to cooperate with the cooperative. (W. Bilson also helped "to link" the interested parties.) Such interest, as well as the practical approach to conversion contained in the plan, created the basis for realization.

"In accordance with the government decision our ministry is engaged in the process of conversion," Yu. I. Tychkov noted. "We have joined in the fulfillment of the Food Program, contribute to the output of consumer goods, and also develop and manufacture medical equipment. Therefore, we regard the proposal by the young scientists with interest and will support them. The project's scientific validity does not evoke my doubts and we are prepared to provide assistance not only with deliveries of industrial products and materials to the center, but also with the enlistment of our ministry's scientific collectives in research. Diagnostic and therapeutic methods developed by physicist specialists at the sector's research institutes in cooperation with foreign specialists can be of a commercial value and be applied not only in our country, but also in radiological clinics in the United States on a parity basis."

A decision on the possibility of establishing within this ministry the first joint enterprise with a foreign firm, in which the future magnetic resonance center will be able to function, is now being studied.

RSFSR Organization Created To Import Medical Equipment

907C0070A Moscow MOSKOVSKAYA PRAVDA in Russian 2 Sep 89 p 1

[Article: "A New Organization for the Purchase of Imported Medical Equipment Is Presented"]

[Text] The name of this organization is Rosmedintorg. It was established under the Rosmedtekhnika Main Administration of the RSFSR Ministry of Health for the purpose of purchasing medical equipment abroad for medical institutions of the Russian Federation. At the same time, it is envisaged that customers have at their disposal currency, with which they will purchase certain products necessary for improving medical services for the public. In particular, it is a question of enterprises and organizations, which receive currency deductions for export deliveries and other activity and have their own medical institutions, or use them on a contractual basis.

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